DISCOVERY

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Edited by L. Russell Muirhead

Volume XVII

JANUARY TO DECEMBER

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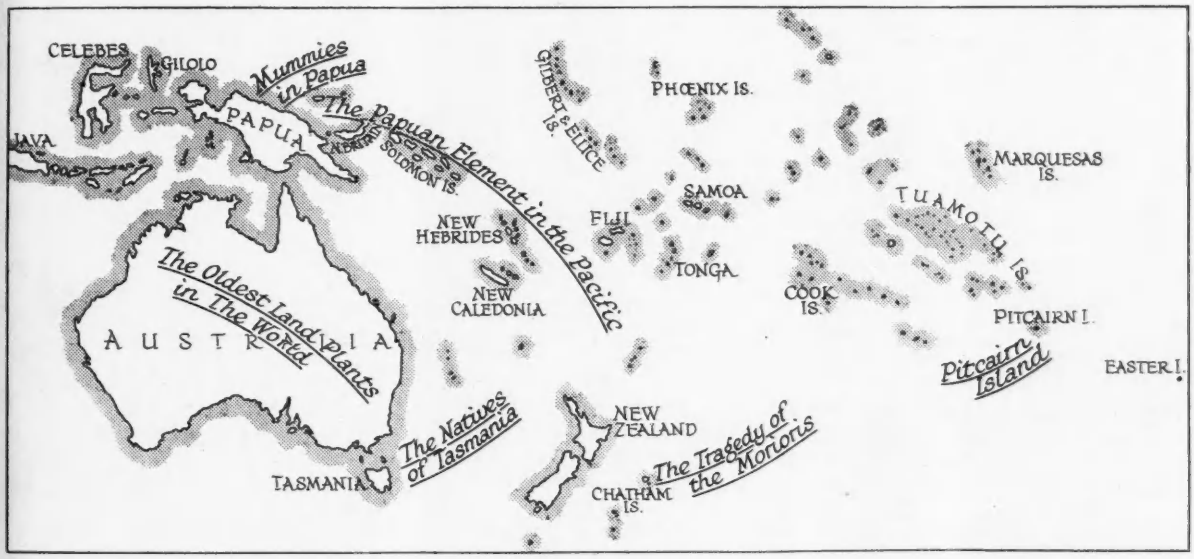

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DISCOVERY : JAN. 1936.
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DISCOVERY

A Monthly Popular Journal of Knowledge

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Notes of the Month.

With the publication of an issue dealing principally with a great terrestrial region—Australasia and the Southern Pacific—Discovery breaks new ground with the beginning of a new volume. While the aims of our journal necessarily imply a particularly widespread net, it is felt that an occasional change from the policy of diffusion will not come amiss; and we hope from time to time to repeat the experiment of publishing a number devoted to some special subject. From the topographical standpoint, an issue similar to the present one, but concerned with tropical African subjects, suggests itself as practicable, and we invite contributions on such matters from readers who are qualified to speak on African affairs from the point of view of recent knowledge. Intervening numbers of the journal will as usual contain articles of wide appeal, and we shall endeavour at least to maintain the standard we have set ourselves in the past.

* * * *

The twenty-sixth annual exhibition of scientific instruments and apparatus, arranged by the Physical Society, will be held in the afternoons and evenings of January 7th, 8th and 9th, 1936, at the Imperial College of Science and Technology, South Kensington. The leading manufacturers of scientific instruments will be exhibiting their latest products in the Trade Section. The Research and Experimental Section will contain contributions from research laboratories, and there will be a special sub-section devoted to experiments of educational interest. Discourses will be delivered at 7.45 p.m. on the evenings of January 7th and 8th. Tickets of admission to the exhibition may be obtained from the Exhibition Secretary, 1, Lowther Gardens, London, S.W.7.

* * * *

A new research laboratory to house the scientific research departments of the London Midland and Scottish Railway Company has been erected at Derby. The building was formally declared open in December by Lord Rutherford, who addressed a distinguished company of guests, including Sir William Bragg, Sir James Jeans, and representatives of practically every branch of industry as well as of the scientific and technical worlds. The departments include a chemical laboratory, a metallography room, a pyrometry room, a corrosion laboratory, a constant temperature and humidity room, two engineering test rooms, a metallurgical furnace room, and laboratories for the investigation of textile materials and of paints and varnishes. The main function of the research laboratory is to test the qualities of railway materials, and all kinds of up-to-date scientific instruments have been installed.

* * * *

Modern Government, to be published quite shortly by George Allen and Unwin, Limited, is Sir Ernest Benn's tenth book and comes three years after his last, *This Soft Age*. In the interval this indefatigable advocate of Individualism has produced 75 numbers of the ill-fated *Independent*. *Modern Government*, however, it is in no sense a party book. The tone is, of course, anti-socialistic, as must be expected from the author of *The Confessions of a Capitalist*, but Sir Ernest has managed to avoid any mention of Socialism, or for that matter any other sort of *ism*. He has made an attempt to study government as a subject. The argument is that we are so busy with all the details of governing ourselves that we have neglected to consider the principles underlying all good government. *Modern*

Government may be described as a restatement of the case for Man versus the State, supported by arguments and illustrations from post-war experience. Sir Ernest Benn's return to the arena will be welcomed by a world-wide circle of admirers. The book, which should be in the hands of the booksellers in a very short while, will enliven the discussion of public affairs, if only because of its ruthless attack upon bureaucracy.

* * * *

The 1936 Meeting of the British Association will be held in Blackpool from September 9th to 16th under the presidency of Sir Josiah Stamp, G.C.B., G.B.E. The following sectional presidents have been appointed; Section A (Mathematical and Physical Sciences), Prof. A. Ferguson; B (Chemistry), Prof. J. C. Philip, O.B.E., F.R.S.; C (Geology), Prof. H. L. Hawkins; D (Zoology), Dr. Julian Huxley; E (Geography), Brig. H. S. L. Winterbotham, C.B., C.M.G., D.S.O.; F (Economic Science and Statistics), Dr. C. R. Fay; G (Engineering), Prof. W. Cramp; H (Anthropology), Miss D. A. E. Garrod; I (Physiology), Prof. R. J. S. McDowall; J (Psychology), Mr. A. W. Wolters; K (Botany), Mr. J. Ramsbottom, O.B.E.; L (Educational Science), Sir Richard Livingstone; M (Agriculture), Prof. J. Hendrick. The President of the Conference of Delegates of Corresponding Societies will be Dr. A. B. Rendle, F.R.S.

* * * *

A new blue pigment, which combines fastness to light, heat, acids, and alkalies with tinctorial strength, has recently been introduced by Imperial Chemical Industries, Ltd. Known as Monastral Fast Blue BS, it should be welcome in many manufactures. It can be used for colouring rubber under all temperatures, and it is quite unaffected by lime. It is a true "minus-red" pigment for three-colour printing, and produces a range of hues as varied as Ultramarine and Prussian Blue without their chemical defects.

* * * *

Owing to pressure of space, our monthly columns on the National Trust and the March of Knowledge are unavoidably held over until the February issue.

* * * *

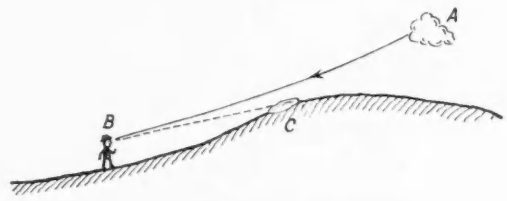
In our December issue, on p. 348, a misstatement was made in the notice about the Brotherton Library. The following are the correct facts. Roundhay Hall, with its contents, was bequeathed by Lord Brotherton to Dorothy Una Ratcliffe (Mrs. McGrigor Phillips), joint donor of the Brotherton Collection to Leeds University. When the joint donors, Mr. Charles Brotherton and Mrs. McGrigor Phillips, gave the Brotherton Collection to Leeds University, Mrs. Phillips sold Roundhay Hall and its grounds to Mr. Warwick Broadbent, who is the present owner.

Correspondence.

MIRAGE ON THE ROADS.

To the Editor of DISCOVERY.

Sir,—Respecting the recent correspondence in "DISCOVERY," concerning the wet appearance of roads in hot weather, Mr. Wakely's explanation does not seem to me to be sufficient. I should like to suggest the following:—



In strong sunshine the layers of air immediately adjacent to the earth are heated to a considerably higher temperature than the higher layers. In consequence, the optical density of the air decreases downwards. So light from a blue patch of sky just above the rise of the road (A) is bent upwards to the eye of the observer at (B). The blue patch thus appears to be on the roadway and resembles a pool of water (C).

This phenomenon is the nearest approach to the mirage that we get in these latitudes.

It will be noted that the position of the sun and the slope of the road play determining parts in producing the effect; while Mr. Wakely's comment on the fact that only one rise in the road is necessary is also involved in this explanation.

Yours faithfully,

Dudley, Worcs. A. W. HEATHCOTE.

CATS AND CATMINT.

To the Editor of DISCOVERY.

Sir,—If your catmint correspondence has not lost its flavour you may be interested in the following.

My sisters have two cats of approximately the same age—eighteen months. These are Toms, and probably related, as they were chosen from among a score or so, all of which were born and bred haphazard at a friend's farm, where they lived in barn and yard. On being presented with a "catnip" ball, which is a piece of cloth stuffed with dried "catnip" or "catmint" sold specially for the delight of cats, one of these took a great fancy to it, fighting it with wild excitement until he destroyed it. The other cat, however, refused to have anything to do with this toy, which appeared to be thoroughly distasteful to him. He seemed to think it might explode if he touched it. From this it appears that fondness for catmint is not a characteristic of all cats.

Incidentally, neither of these cats pays any marked attention to the catmint growing in the garden.

Yours faithfully,

A. J. M. HARRIS.

Cyril Mansions, London, S.W.11.

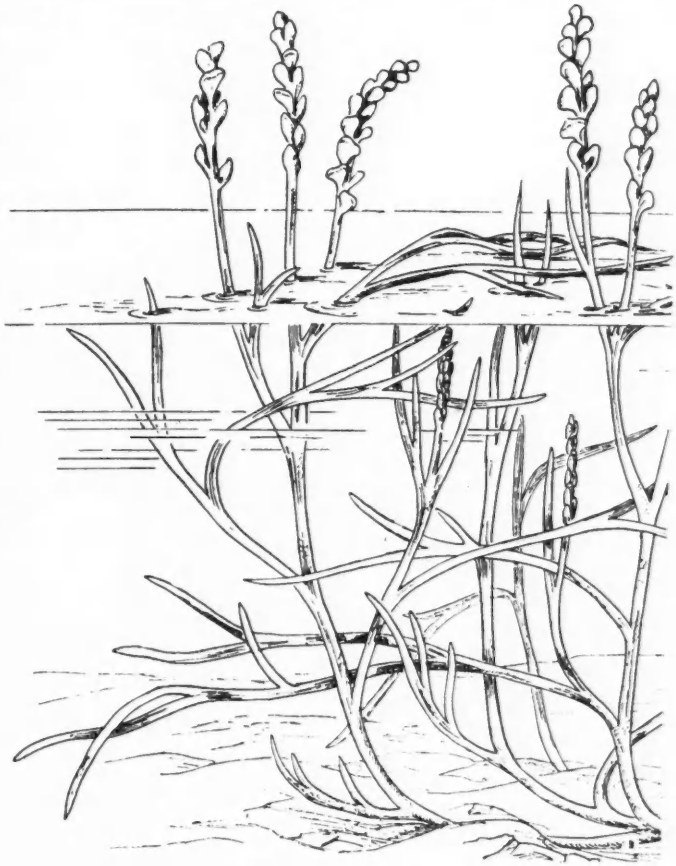
The Oldest Known Land Plants in the World

By A. C. Seward, Sc.D., F.R.S.
Professor of Botany in the University of Cambridge.

The purpose of this article is to give a short account of some fossil plants recently described from Silurian rocks in Victoria, Australia. They are of great botanical importance as samples of the most ancient land-flora so far discovered. The author is indebted to his friend, Professor Lang, of Manchester, for the photographs, which are good examples of the ability of Mr. E. Ashby to obtain remarkable results from material that is hardly photographable.

WHEN we read in the Story of Creation: "And God said, let the earth put forth grass, herb yielding seed, and fruit trees bearing fruit after its kind, wherein is the seed thereof, upon the Earth: and it was so," our imagination is quickened and we wonder what manner of plants they were which formed the advance guard of the hosts that followed after. Belief in some kind of evolution creates a desire to learn as much as possible about the early stages in the past history of the plant-world. Not long ago the writer received a letter asking for an answer to the question, what was the first plant to produce flowers? Would that an answer could be given. The search for origins will never end: as new discoveries are made among the treasures contained in the rocks, the oldest plants and animals of one age are found to have been preceded by still earlier forms. Each new discovery takes us a step nearer to the beginning; and yet the comparatively high level of organisation of the most ancient plants so far obtained affords convincing evidence that there must have been a long series of ancestral forms of a much more primitive kind. We shall never find in the older Palæozoic or in the still older Pre-Cambrian sediments the first representatives of the plant kingdom: all that we can hope to do is to gain information which may throw light upon the course of development as indicated by the construction of the plant-body and by methods of reproduction. The earliest remains may at least enable us to visualise in some degree the lines along which development proceeded: we can only make guesses at the truth.

It is generally believed that life first appeared in the sea: ultra-microscopic particles of living protoplasm were the germs from which visible free-floating organisms were derived; in course of time they reached a higher grade of construction and adopted a sedentary existence on the ocean-bed. Botanists differ widely in their conception of the first colonisers of the land: the pioneers may have been very simple microscopic plants which in the course of ages developed into larger and more complex types; or it may be that some comparatively highly organised marine plants attached to the sea-floor were gradually transferred to the land as the water receded or the surface of the earth was slowly upraised. The question is, whether seaweeds could adapt themselves to the change from water to land and successfully cope with the exacting demands made by the new environment.



Zosterophyllum: *a reconstruction published by Professor Kräusel and Dr. Weyland, of Frankfürt, in* 1935.

It is at least worth while, in considering the oldest known land plants, to bear in mind the possibility that they may have come from marine ancestors.

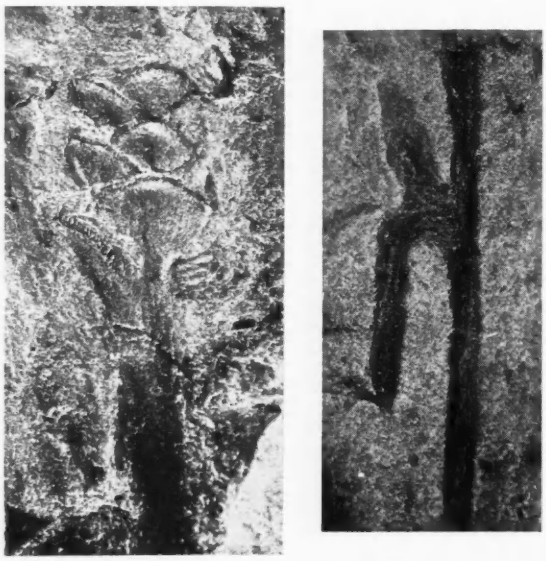
The following list of the Palæozoic periods will help us to form an idea of the relation in time of the Silurian rocks, in which the oldest known land plants have been discovered, to the earlier and some of the later periods.

Geological Periods of the Palæozoic Era.

Permian
Carboniferous
Devonian { Upper / Middle / Lower }
Silurian
Ordovician
Cambrian

Pre-Cambrian (Archæan) Era.

The Silurian rocks were formed more than 300 million years ago and those of the much older Pre-Cambrian era represent a lapse of time going back probably 2,000 million years. The terrestrial vegetation at the beginning of the Permian period differed in no essential features from the richer floras of the last phase of the Carboniferous period when luxuriant forests were spread over an enormous area in the northern hemisphere. It was in the latter part of the Carboniferous period that the Palæozoic vegetation reached its culminating point: the forest trees were in the main members of families that have long been extinct; there were a few plants which linked this remote age with the present, but as a whole the vegetation was botanically far removed from that of the modern world. The floras of the earlier part of the Carboniferous period had many trees and smaller plants in common with those of the Coal Age (Upper Carboniferous): they were less rich in genera and species. The Upper Devonian vegetation was still less varied though bearing a general resemblance to that which immediately followed it. Passing to the middle of the Devonian period we find many unfamiliar and relatively primitive plants and a flora differing in many respects from the more advanced and richer Upper Devonian flora. The still earlier Lower Devonian flora has some members in common with that of the Middle stage, but the number of genera has decreased and the plants as a whole, though by no means very primitive, are on a lower plane of evolution. A few years ago the oldest known land plants were those from Lower Devonian rocks: now some of the same, or closely allied plants have been found in Silurian sediments, and with them a few that are new to science. We are at present concerned with the history of the vegetation of the land, not with the vegetation of the sea as represented by remains of seaweeds in Ordovician and Cambrian rocks. There is as yet no absolute proof of the occurrence of plants in the thousands of feet of Pre-Cambrian rocks. For an account of the oldest known plants of the sea the reader is referred to other sources.



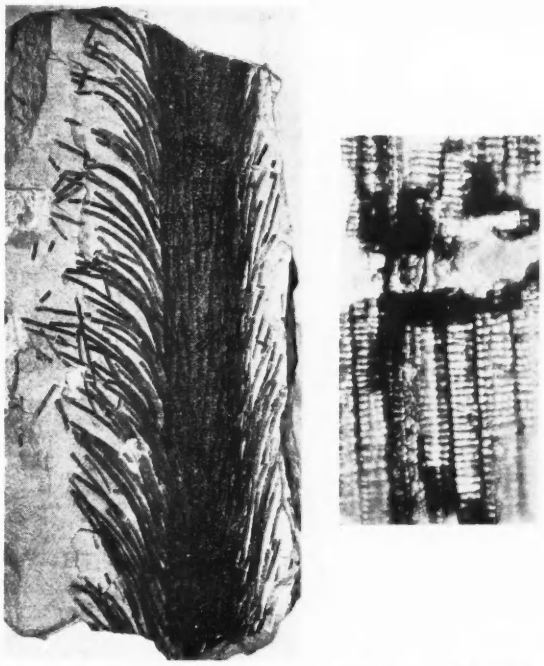
Zosterophyllum: *left, a group of spore-capsules, twice natural size, at the end of a branch of the Australian Silurian species; right, a good example of a peculiar and very characteristic feature, a lateral branch divided into an ascending and descending limb producing an H-shaped appearance* (×5).

Before considering the Australian fossils reference should be made to two undoubted plants that have long been known from Silurian rocks in England and elsewhere, though probably both of them belong to the class Algæ and lived in the sea. One of these is *Pachytheca*, a small spherical plant about 4 mm. in diameter, characterised by a central region, or medulla, partially occupied by simple tubular cells forming a loose felt, and a peripheral region made up of regular radially disposed tubes. This genus has now been found in Australia: it is recorded also from Norway, Great Britain, Canada, and elsewhere. The other, *Nematophyton*, is a much larger plant with stems several centimetres in diameter, composed of a loose plexus of large and small tubes for the most part parallel to the long axis: it has been referred to different positions in the plant kingdom, but until its reproductive structures are known we cannot say with certainty whether it was a marine alga or possibly a peculiar type which had established itself on land. Like *Pachytheca*, *Nematophyton* was a widespread genus in the northern hemisphere, from the Libyan desert to North America and Europe; it has not been discovered in Australia. Other supposed land plants have been

described from Silurian rocks in the northern hemisphere, but none are convincing.

Remains of Australian Silurian plants were first recorded by Mr. F. Chapman of Melbourne several years ago, and there was much discussion on the geological age of the beds, whether they were Devonian or Silurian. The description of the plants given below is based on the more recent researches of Professor Lang and Dr. Isabel Cookson. Fossils were found at several localities in Victoria in beds assigned by local geologists to the Silurian period, though not all on the same horizon. There was no satisfactory evidence of their age, and opinions differed. The general similarity of the specimens to fossils previously described from the northern hemisphere was regarded as evidence of a Devonian rather than a Silurian age. Plants of the same kind are by no means always confined to one geological horizon; closely allied forms often persisted from one age to another; they are less trustworthy than some animal fossils as guides to the precise age of sedimentary rocks. A fortunate discovery of Graptolites associated with plants in the same layers of sediment may be said to have settled the question of age of the Australian beds. Graptolites are extinct marine creatures remote from any living animals but having features in common with the Hydrozoa and Bryozoa: the species are known to have had a short vertical range and are therefore very useful as tests of age. The Graptolites preserved with the plants were recognised as Silurian forms by Dr. Elles of Cambridge.

The following Silurian plants from Australia are selected as the most striking illustrations of the records so far available of the oldest known terrestrial flora. *Zosterophyllum.* This name was given to a Lower Devonian plant from Scotland because of its superficial resemblance to the Eel Grass, a marine flowering plant, *Zostera*. It is represented by slender leafless branches about 2 mm. broad, reaching a length of 15 cm.: specimens are occasionally branched and some of the branches bear a terminal group of more or less kidney shaped spore-capsules on short and broad stalks. A slender strand of woody tissue made of tubular elements with transverse bars of thickening runs up the centre of each branch. The plant may be described as a tuft of slender branches without leaves, borne on an underground creeping stem without roots. Some of the sporangia have yielded well-preserved spores which on maturity were shed through a horizontal slit along the broad upper surface of the capsule. *Zosterophyllum* is very different from any existing plant: its branches may be compared with the upright shoots of some Club Mosses, e.g., *Lycopodium clavatum*, with a terminal group of spore-capsules: the chief differences are the absence



Baragwanathia: *left, a piece of stem thickly clothed with leaves; right, a section of the woody conducting strand* (×100).

of leaves and the simpler structure of the conducting strand in the Palæozoic plant. This Devonian and Silurian plant is one of several genera characteristic of the oldest floras which have been assigned to a group known as the Psilophytales, called after the Devonian *Psilophyton* founded many years ago on specimens from Canada and discovered in other parts of the world. *Psilophyton* was named after the living tropical genus *Psilotum* that is allied to the Club Mosses though not sufficiently close to them to be placed in the same family. It is not easy to draw a clearly defined line between the Psilophytales and the Lycopod group, and *Zosterophyllum* shows features foreshadowing both these subdivisions of the plant kingdom. On page 3 is shown a copy of part of a reconstruction of a German, Lower Devonian species of *Zosterophyllum*. It is possible that the plant grew in shallow water, though it may have lived on land.

Baragwanathia. This genus, named after Mr. W. Baragwanath, Secretary of Mines for Victoria, who collected the first specimen, is a much larger plant with stems, nearly a foot long (28 cm.) and of a diameter of 2 cm. or more, bearing long and very narrow leaves. Some much broader specimens were found showing spirally arranged scars from which the leaves had fallen. A piece of stem thickly clothed with leaves is seen above,

slightly below natural size. A small piece of the woody strand of conducting tissue is shown, 100 times natural size, in the adjoining illustration, with well defined transverse bars of thickening on the walls of the tubular elements. The conducting strand differs from that of *Zosterophyllum* in being fluted and not a simple cylindrical rod: it has a star-shaped form as seen in transverse section. *Baragwanathia* resembles the existing genus *Lycopodium* in its forked and leafy stem, in the occurrence of spore-capsules attached to the upper surface, and near the base of the leaves, and in the form of the central woody strand. The occurrence of spore-capsules in certain zones on the leafy shoots is a character shared with the Club Moss, *Lycopodium Selago*. Since the description of this genus was published by Professor Lang and Dr. Cookson specimens of a similar type of plant have been described by Professor Kräusel and Dr. Weyland from Lower Devonian rocks in Germany and referred by them to the genus *Drepanophycus*. It is probable that the Silurian Australian genus is closely related to Early Devonian plants from Canada and Europe which have long been known as *Drepanophycus* and *Arthrostigma*. The available material is hardly sufficient to enable us to say whether or not the numerous specimens from Lower Devonian rocks, which resemble the Australian fossils described under a new name, should be assigned to one genus. The important point is the very wide geographical distribution of a similar type of plant in the oldest known floras.

Yarravia. This genus, called after an Australian locality, is represented only by pieces of fertile branches. In the photograph herewith a cluster of oval capsules with black contents, no doubt derived from masses of spores, is enlarged three times. An interesting feature is the resemblance of the leafless branches to those of *Zosterophyllum*, but in *Yarravia* the spore-capsules form a radially symmetrical group and are laterally coherent: they seem to be arranged around a central space. Though there are no Devonian plants with which this Silurian genus exhibits a close resemblance, it is noteworthy that certain spore-bearing branches of Carboniferous plants recently described by Professor Halle of Stockholm are constructed on similar lines. *Yarravia* is a relatively advanced type in which the partial union of a circle of spore-capsules suggests a higher grade of evolution than the separate and spiral arrangement in *Zosterophyllum* or than the terminal position at the tips of branches characteristic of the Devonian *Psilophyton*.

Left. Yarravia: *a cluster of oval spore-capsules* (× 3). *Right.* Hedeia: *characteristic candlestick-like arrangement of the branches and spore-capsules* (×2).

Hedeia. The name *Hedeia* was given by Dr. Cookson to leafless branch-systems in which the tips of the ultimate subdivisions bore elongate oval bodies believed to be sporangia. As shown in the adjoining photograph, a characteristic feature is the arrangement of the capsules as a group in which the component parts are on the same level, reminding one of a seven-armed candlestick or of the inflorescences of such familiar flowering plants as the Candytuft, Carrot, and many others. This comparison is, of course, not intended to imply even a remote relationship; in the one case we are dealing with simple spore-capsules, in the other with true flowers of complex structure. *Hedeia* is confined, so far as we know, to Silurian rocks: it is no doubt related to the Devonian *Psilophyton* and other Psilophytales.

Among other plant remains from Australia a brief reference may be made to *Sporogonites*, a genus previously described from Lower Devonian rocks in Norway: it consists of an axis bearing a terminal spore-capsule resembling in some degree the corresponding organ in certain mosses. This imperfectly known type serves as another illustration of wide geographical range and the similarity of Silurian and early Devonian plants.

What do we learn from these oldest examples of a land flora? It would seem that certain plants, having a far-flung distribution in North America and Europe in the earlier part of the Devonian period, were living in Australia at a still earlier stage of geological history. According to the orthodox view, that each well defined type of plant had its origin in one place and then spread to other parts of the world, one inference is that the almost cosmopolitan character of these ancient plants is evidence of a very considerable lapse of time sufficient to enable them to wander passively from the far south to high northern latitudes.

Another possible inference is that the original home of certain genera was in Australia. There is abundant

proof of the occurrence of the same genera and closely allied species in the Silurian flora of Australia, and in the Lower Devonian floras of Canada, Norway, Spitsbergen, Great Britain, Western Germany, Bohemia, the Falkland Islands, and South Africa. The oldest vegetation of the land, which has left recognisable records in the sediments of the older Palæozoic estuaries and deltas, impresses us by its general uniformity—leafless plants bearing terminal spore-capsules in loose cone-like groups (*Zosterophyllum*), plants with a relatively large cylindrical spore-capsule at the tip of a leafless axis (*Sporogonites*); branchlets forming a regular system of fertile arms rising to a common level (*Hedeia*); plants with naked branches crowned with a compact whorled cluster of partially coherent capsules (*Yarravia*); and plants such as *Baragwanathia* (and *Drepanophycus*) which differ but little from *Lycopodium selago*, a cosmopolitan species in floras of the modern world.

Is it conceivable that these and other examples of the earlier colonisers of the earth's surface were not evolved, each in a single locality, whence they were scattered by wind-borne spores over widening areas? It may seem a fantastic alternative to suggest that in widely separated regions marine plants were being transformed into dwellers on land, and that in those far-off days the production of new forms was the expression of some developmental force acting uniformly and along predetermined lines inherent in the living substance of the plants.

There are many aspects of geographical distribution which raise problems awaiting solution. The study of the oldest botanical records may provide clues to the better understanding of the present state of the plant-world. The oldest known plants afford a striking illustration of contrasts: strange forms remote from any that are left, and yet amazingly similar in structural features, having the same forms of cells, the same kind of tissues, the same kind of spores, the same mechanism for the conduction of water and for the exchange of gases between the plant and the external air.

The description of the Silurian and to a large extent of the older Devonian fossils is based on the researches of Professor Lang, and, in part, of Dr. Cookson. From unpromising material, which a few years ago would have been discarded as too imperfect to be described, Professor Lang has been able by the employment of modern methods of technique to obtain surprising results of the greatest scientific value.

For a general account of the older Palæozoic plants the reader is referred to the writer's *Plant Life through the Ages* (2nd Ed.), 1933.

Descriptions, with excellent illustrations, of the Australian plants will be found in the Philosophical Transactions of the Royal Society of London, Vol. 219, 1930, p. 133 (Lang and Cookson); Vol. 224, 1935, p. 421 (Lang and Cookson); Vol. 225, 1935, p. 127 (Cookson).

Myriad Goldfish.

One of the queerest of trades is the purveying of those small beasts and reptiles upon which our biologists make their experiments for the good of mankind and the furtherance of scientific knowledge. Imagine a warehouse filled almost to overflowing with small fish of various kinds, frogs, lizards, and less familiar reptiles; a commercial vivarium, in fact, with a good supply of live chicks, guinea-pigs, and so on, within easy reach. Such an establishment exists to-day in a narrow street south of the Thames, and it is from there that are supplied, not only laboratory dissecting-rooms, but also our ornamental pond-gardens and aquaria, and the goldfish bowls that deck our fishmongers' slabs.

The strongest impression is left by the goldfish—carp, orfe, and rudd—with which many large tanks are filled. Like the notorious salmon in the Irish river, they are almost "shouldering each other out of the water." Just now they are specially abundant, because like many better-known trades, the goldfish trade is much affected by the sanctions against Italy. It is in the mild Italian climate that the goldfish breed most prolifically. But for some time past none of the large bulbous tins, encased in basketwork, which transport them, has been seen at the London termini; and soon there may be a goldfish famine!

More interesting, though less plenteous, are the odd amphibians in smaller tanks: sluggish axolotls, South American water-dwelling frogs, and newts of various species. The interested visitor is welcomed, and may well spend a pleasant half-hour in this queer repository, typical of the multifarious activities of industrial London.

The Country-Side Diary.

The fourteenth edition of *The Country-Side Diary*, entirely revised and rewritten, with a set of new nature photographs, quite comes up to the high standard set by its predecessors. More than a score of contributors, many of whom are well known as watchers of wild nature, supply the weekly and monthly notes. A useful series of short reviews of nature-books for the year is appended, and that valuable section, *Our Common Cause*, gives a needful reminder of the heritage of wild life in Britain that nowadays we seem so anxious to waste and destroy. The other merits of the Diary are too numerous to catalogue here; those who wish to explore them may obtain copies of the Diary post free for 2*s*. 6*d*. or 4*s*. (according to the binding) from the Editor: Richard Morse, Wilbury Eaves, Letchworth, Herts.

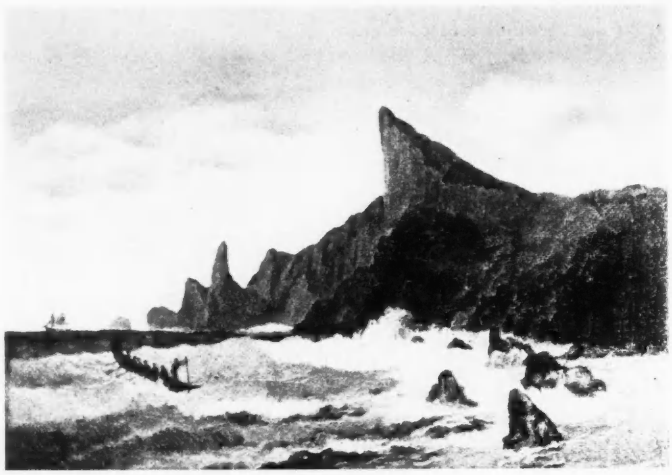
Pitcairn Island.

By Mary Edmonds.

The mutiny of the "Bounty" is one of the most extraordinary stories of British maritime history. How the mutineers fared, and what the position of their descendants is to-day, is the theme of this remarkably interesting article.

Two days before the Christmas of 1787, an armed transport of His Majesty's Navy, the good ship *Bounty*, set sail from Spithead, under the command of Lieutenant William Bligh. She was bound for Tahiti to collect breadfruit plants, which were to be transported to the West Indies and there cultivated as cheap food for the negro slaves. The ship was only ninety feet long, and as the large cabin had been rigged as a garden, with racks of pots for the breadfruit plants, there was little enough space for the forty-five men on board.

In a cruel age, when human life and comfort counted for little, Bligh was nevertheless a hard man. Brilliant navigator, one of the best cartographers in the service, a born explorer, his discipline was yet stern to the point of brutality, and his temper at times ungovernable. The nine months' passage to Tahiti was hard, rations were kept short, and the men were miserably cramped. Once at the islands, however, the tension relaxed, and for the next six months there was relative contentment.



Pitcairn Island, from an old print, showing the rocky nature of the coast, but somewhat exaggerated.

The homeward journey began at the beginning of April, 1789, and after the life in Tahiti, the gentle courtesies of its charming people, and unaccustomed good living on exotic fruits and delicate fish and meats, the rigours of the old discipline, harsh as ever, became unbearably irksome. The master's mate, Fletcher Christian, a Manxman, seemed most often the victim of Bligh's rages. In despair, Christian tried to desert on a raft and return to his Tahitian wife, but there was not enough wind for his purpose and he had to abandon the idea. The next morning, still brooding over Bligh's latest insult, he suddenly mutinied and seized the ship and Lieutenant Bligh. Half the men rallied to Christian immediately. Bligh was ordered into the launch, with as many men as wished to accompany him. Eighteen followed him. There was room for no more. Nineteen men in an open boat, twenty-three feet long and two feet nine inches deep, unarmed amongst fiercely hostile islands, with thirty-two pounds of pork, a hundred and fifty pounds of bread, six quarts of rum, six bottles of wine and twenty-eight gallons of water, were set adrift in mid-ocean.

They were on the sea for six and a half weeks, eventually reaching Timor, after travelling a distance of over 3,500 miles. Except when they found an uninhabited island and a supply of oysters, their allowance was a twenty-fifth of a pound of bread, two or three times a day, an occasional morsel of pork and a wineglassful of water. Towards the end, half the men were too weak to walk, and were covered with salt-water sores. Their clothes were reduced to a few rags. Sometimes the boat rode mountainous seas and water poured in faster than they could bail it out. Sometimes they were blistered by the stabbing rays of the tropical sun. Occasionally they caught a fish, but their stomachs became too weak to take the raw flesh. One man went mad. Several more survived, only to die on reaching Timor. The story of that journey still remains the bravest and most remarkable feat in English naval history.

The indomitable Captain Bligh, on his return to England, set out once more to gather breadfruit from Tahiti, but his efforts were of little use, for an unimpassioned report states after all that "the West Indians preferred the plantain to the breadfruit."

The Pitcairn community of to-day, outside their Seventh Day Adventist church.

The *Bounty* mutineers under the leadership of Fletcher Christian, took the ship back to Tahiti. Here several remained until the British frigate, the *Pandora*, arrived at Tahiti, two years later in search of them. They were clapped into irons, brought back to England, tried by court martial, and three of them strung up to the yard arm in Portsmouth Harbour. Christian, determined to escape from justice, decided to leave Tahiti for an uninhabited island. He took with him eight of the *Bounty* crew, Edward Young, Alexander Smith (known as John Adams), John Mills, William McCoy, Matthew Quintal, John Williams, Isaac Martin, and William Brown, each with a Tahitian wife. There were also on the *Bounty* six Tahiti men, three of whom had brought their wives, half a dozen crates of fowls, twenty sows, five boars and three goats.

In Bligh's cabin, Christian had found Captain Philip Carteret's account of the discovery of a small island, which his midshipman, Pitcairn, had sighted in 1767, and he decided upon this for his refuge. After three months' cruising, the mutineers at last found Pitcairn and landed, twenty-seven souls alone on an isolated island. The prospect was pleasing enough, for although only two miles long and less than one mile wide, with a rugged and precipitous coastline, the interior is beautifully wooded, and volcanic activity has produced a rich and fertile soil. To the north, they found a suitable spot to settle, a broad sloping valley between two high ridges of rock. There were evidences of a previous occupation on the island : stone axes, stone pillars, stone figures similar to those of Easter Island, and skeletons of men who had been buried with pearl mussels placed beneath their heads, in the fashion of the Tahiti people. How these people came there, or why they vanished, no one knows.

The strange group of mutineers, one of the earliest British Colonies in the Southern Hemisphere, burned the *Bounty*, so destroying all chance of further contact with the rest of the world, and began its task of building houses and clearing areas for cultivation. The island might have been a paradise. Lying 25° south of the Equator in mid-Pacific, its climate was perfect, with no extremes of temperature, and an abundance of fish, fruit and vegetables were at hand. But the *Bounty* men, rough and unlettered, and at best unruly, turned Pitcairn into a hell, despite Christian's attempt to keep order and treat all men fairly. Like many Europeans, brought into sudden contact with a simpler people, they treated the natives as sub-humans. The first trouble began to brew when the Englishmen failed to show a proper respect for some of the Tahitian religious symbols, but Christian's tact and intelligence smoothed matters over for a time.

The Tahitians were of varying ranks, and deeply conscious of the differences in their social status, but they had the communistic attitude to property characteristic of their race. Amongst the Europeans they saw this order of things reversed. Christian they knew to be a leader, and they were puzzled to see that, instead of asserting his authority, he put every matter concerning the affairs of the islanders to the vote. At the same time, the Europeans soon insisted that the island be parcelled out amongst themselves, and endeavoured to reduce the Tahiti men to a state of slavery.

Then Williams's wife died and he asserted his right to take one of the Tahitian's wives in her place. To add to all this unhappiness, McCoy contrived to manufacture a still, and discovered that from *ti* roots he could distil a concoction strong enough to warm even his tough Scottish heart. Sexual jealousy, race antagonism, and social snobbery, the three greatest forces of evil, were let loose on the island, and arson, theft, rape, drunkenness, debauchery, and murder by musket, club,

and poison were the result. One man went mad: two women committed suicide. One night, the natives revolted and murdered half the English. The widows shot all the Tahitians, their husbands' murderers, and "drink and the devil" accounted for two more Englishmen.

Peace at Last.

By 1800, only one white man, John Adams, survived, and he lived with patriarchal dignity, loved and respected by all the women and half-caste children. Life was idyllic. The bitter memories of the older women and the Englishman had been dimmed by the beauty and peace of the island, and the happiness of the younger generation, growing to maturity, utterly carefree, and innocent of any knowledge of their tragic history.

In 1808, eighteen years after the colony was founded, the first visitor arrived at the island, Mr. Folger, in command of the American whaler *Topaz*. He found thirty-five people there. From then on, visitors called at irregular intervals, and in the middle of the 19th century Pitcairn became almost a regular place of call for American whalers, the islanders trading fresh food, sweet potatoes, taro, yams, pumpkins, water melons, rock melons, French beans, cow-peas, bananas, oranges, pineapples, passion fruit, custard apples, alligator pears, and breadfruit, for light clothing, kerosene oil, soap, candles, buttons, needles, and cottons.

In 1831, the Government began to fear that the numbers on Pitcairn were growing too great, and the *Lucy Anne* was sent from Sydney to move the population to Tahiti. Disease carried off seventeen in a few months, and the following year the survivors returned to Pitcairn.

In 1856, Sir William Denison, the Governor of New South Wales, removed the entire population of 194 souls to Norfolk Island, but again many grew homesick, and within two years, some of the islanders had returned to Pitcairn. So the descendants of the *Bounty* mutineers are now divided over these two lonely islands, three thousand miles apart.

In 1915, two of the Islanders, Charles and Edwin Young, were brought to England, and examined by Sir Arthur Keith. He reported that their physical characteristics were predominantly Tahitian, and an examination of chronological tables showed that, in the case of these two men, they were 13/32 British and 19/32 Tahitian. In appearance, they resembled Levantines or South Europeans. They were splendidly developed physically, and though their mental ability was not great, there was no question of degeneration through intermarriage. However, the population of the island is small, and it has been suggested that one cause of this may be infertility brought about by inbreeding. The islanders themselves would welcome the immigration of a few agricultural families, who would introduce fresh blood and bring new methods of cultivation.

One phenomenon noticed by all visitors to the island is the curious tendency to lose the upper front teeth. Numerous theories have been expounded, and the reticence of the islanders in discussing the matter has suggested that the teeth were removed for a religious rather than a physical reason. However, a more probable explanation is the lack of lime on the island.

The Pitcairn people show an amazing agility in managing the difficult ascent from the harbour to their one settlement, Adamstown, a village of about thirty-three houses, and are remarkably skilful in handling boats.

Pitcairn is the island one dreams about, with no money, no poverty, no riches, no disease, no toil; but already, as contact grows with the outside world, this idealistic communism is disappearing, and individualistic tendencies increasing. She is anxious to establish a firm market for arrowroot, her most valuable commodity, and to maintain and increase communication with her nearest market for oranges and bananas, Tahiti. Slowly but surely she is being caught up in the commercial maelstrom. Yet her women still wear pandanus leaf hats, modelled on the lines of the British men-of-war headgear of 1789. Romance is not yet quite dead.

The Empire Short Route to the South Seas.

If business necessitates travel to New Zealand or Australia, time is an important factor. The fastest service from England to New Zealand is the route operated by the Canadian Pacific in conjunction with the Canadian-Australasian Line. The journey from England to New Zealand, which can be completed in 31 days, is full of interest and attraction. For the tourist in search of sunshine and scenery New Zealand and Australia offer a splendid objective; and the route across Canada, with its majestic panorama from coast to coast, cannot be adequately described in our limited space.

New Zealand—the home of the sportsman and tourist—is world-renowned for its fishing, yachting, and all outdoor sports. The scenery along the Wanganui River and the wonders of the Geyser region are never to be forgotten. Finally Sydney, which proudly boasts of the finest natural harbour in the world, welcomes you to that vast Dominion "down under." So seek New Zealand and Australia, for business or pleasure; travel via Canada and your choice will be well rewarded.

The Tragedy of the Morioris.

By Barwell-Summit.

Like the Tasmanians, the Morioris of the Chatham Islands are an extinct race, though in this case their extinction was due partly to their own faults. This history of their fall throws light on a little-known dependency of the Dominion of New Zealand.

It sometimes happens that events bring outlying parts of the Empire suddenly into prominence. Then everybody is eager to learn more about them. Very often it is found that the world at large up till then has had no knowledge of a very interesting past and present of a small group of people. These people may never have played any decisive rôle in any decisive matter, but to them, nevertheless, their little wars were just as serious, their own achievements just as glorious, as are their larger affairs to those nations who decide the fate of the world — at least, as far as we know it.

An outlying part which never has been in the limelight, but the history of which is none the less interesting, is the Chatham Islands. Situated about 530 miles east of Port Lyttelton, New Zealand, they form a part of that Dominion. They consist in the main of rocky islets; only three islands — Pitt Island, South East Island, and Rekoakoa — are of some size. Of these only the last-named is inhabited. The present very mixed population consists of about 550 souls, though formerly Rekoakoa seems to have had over 2,000 inhabitants. The principal occupations of the people are sheep farming, cattle breeding, fishing, and dairying.

[By courtesy of the British Museum.

A group of Morioris.

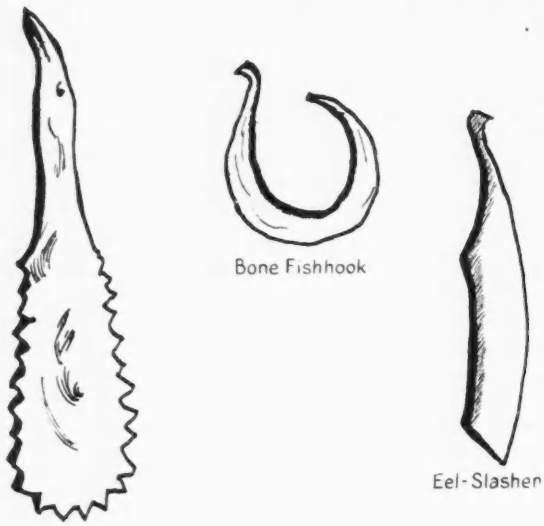
Connections with the rest of the world are meagre. In summer there is a regular boat service to Port Lyttelton for the transport of wool and sheep, and for the few passengers who from time to time wish to go forth into the world. Winter transport is a haphazard business. Usually the boats come only when they assume that the freezers of fishing companies, which operate on the island, are filled. The trip to Port Lyttelton takes about three days. But as there are no proper loading facilities, everything must be brought to the ship by launch, and with wind and weather interfering, the stay in harbour is sometimes longer than the trip itself. The difficulties that the winter weather on the islands presents to shipping can be easily understood, as the climate differs not much from that of the English south coast. The islands are rather low lying, and mist is common during the colder season. This accounts for a sufficient humidity of the soil which on the average is of good quality, as the droppings of sea birds (guano) provide it with sufficient manure.

The fauna consists mainly of sea birds and fishes. A prominent and rather interesting rôle is played by the swans which were introduced only during the last century by the white settlers. They are forced to observe a certain rhythm of fertility. In the centre of Rekoakoa is a large lagoon, commonly called "The Lake." This has an outlet into the sea which always after a certain length of time is blocked up by sand. After it becomes closed the water inside the lagoon gradually wells up, till in about three years the people wake up to the fact that something must be done. They therefore get busy and open the outlet into the sea. The water level falls quickly, and the water-weeds, which have been growing during all these

years, as well as the small shellfish which live on the weeds, come up to the surface. The swans which feed on both find a spread table ; they regale themselves with food and become prolific. They lay eggs in great quantities, and although the inhabitants of Rekoakoa are very fond of these eggs, there are always enough left for cygnets to come out. It is not unusual to find nests with up to 30 eggs. Saddlebags are strapped to horses, and egg-gatherers fill these bags in no time. They usually break one egg in each nest, in order to see whether the eggs are still fresh. But—the multiplication means a big lessening of the food supply per head, and at the same time the outlet becomes blocked up again ; the water starts to rise anew. The swans thus can eat only what is on the surface. They stop laying eggs and become thin again. With the passing of another year they are in fact so thin that they are unable to flee when chased. A number of them even starve to death. However, they are not chased, for the inhabitants, who regard swan meat as a delicacy, catch them only in the " fat " years. By the time their food supply is at its lowest, the water level is at its highest, which means another opening of the outlet, a sinking of the water level, richer food, more eggs and so on *ad infinitum*.

The inhabitants of Rekoakoa do not need to despair during the time when the swans have their meagre years, as other delicacies are always to be found on the island. One of them is the Mutton Bird. It is a sea bird of the colour of an English raven and about the size of a common gull. It usually lives in the Antarctic, but comes as far as New Zealand in the nesting season. Its method of bringing up its young ones is unique. The mother bird lays one egg, in a burrow on the rocky sand coast, returning to the same nesting place year after year. When the egg is hatched, the mother feeds the young one till it is very fat and bigger than herself. With this she thinks her duty is fulfilled. The young one is left to itself and naturally loses in weight, which enables it in the end to slip out of the burrow and go down to the sea to swim around in search of food. By this time it has lost its down and has grown feathers. Just before they reach this stage the birds are considered best for food. They have not yet attained the black colour of their parents, but are covered with a bluish down, the colour reminding one of the Scotch thistle. There is a special method of digging the bird out of its nest. A rough-edged stick is prodded down into the burrow, and if it comes out with down on it, it is a sign that the bird is still in the nest. The killing of the bird is effected in a rather crude way by the natives ; they crunch through the skull with their teeth. But before that they hold their victim up by its legs and let it vomit out the fish oil which has collected in its stomach, owing to its being fed by its mother with fish.

Bone Flute decorated with rectilinear figures.



Examples of the craftsmanship of the Morioris.

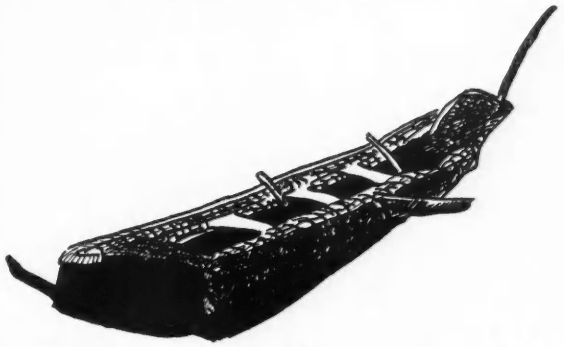
Just as interesting as the animals which populate Rekoakoa is the history of the inhabitants. The original settlers on the island were Morioris or Maruiwi, people of a Polynesian strain who had settled on New Zealand. According to the legends handed down their ancestors once, when fishing, were caught by a storm and driven off their course till at last they reached New Zealand. Some time later another migration of Polynesians took place. This was when the present Maoris came to New Zealand and intermarried with the Morioris. Further migrations drove the descendants of this mixture toward the southern part of New Zealand till at last they were forced to seek a new home altogether. A century before this, the Chatham Islands had been discovered by fishing parties and directions as to how to reach these islands had been handed down from father to son. Only six canoes were required to convey the remnants of the once proud discoverers of New Zealand to the Chatham Islands. But their fighting spirit, which had led them even to indulge in cannibalism, had not been lost.

If the legends can be relied upon, the hardships of

their new island home must have been great, indeed. To this day, one can see a number of skulls and bones on the beach of Rekoakoa, at the spot where a little stream enters the sea. It is said that these are the skeletons of the occupants of one of the six canoes, who, driven by hunger and especially by thirst, gorged themselves with water as soon as they struck land and died from the effect of so much water on an empty stomach. If the legends can further be relied upon this took place about 25 generations back, or about 1200 A.D.

After the newcomers had really settled down, their number increased. But their fighting spirit saw to it that they did not become too strong in numbers. They separated into two principal tribes, one at the north side, the other at the south side of the island. There was constant bitter warfare between the northern and the southern clans. Protection was nearly impossible, as, owing to the scarcity of wood, no palisades could be built around the villages. The women fought together with the men ; thus no secure refuge was provided for the young. In the end the warriors themselves felt that the constant fighting would soon cause the whole population to disappear. They held a conference at which it was decided that women should no longer partake in the fights, also that there should be no enmity beyond the actual battlefield, which meant that no pursuit of fleeing enemies should take place. However, experience taught that this was not enough to bring about an increase in the number of the inhabitants, and that even the limited warfare did not allow time tor tilling the soil.

Therefore, after a number of years, another conference was called in order to reach an agreement by which all fighting was to be stopped for good. However, no agreement was reached. The taste of the flesh of fallen enemies had become so agreeable that the desire for it overshadowed the desire for peace. The conference, therefore, achieved just the opposite of what it had been called for. A great battle was fought and numerous men on both sides were cruelly slaughtered. While the clang of arms and the cries of the blood-thirsty warriors were at their height, a chief, Nunuku, who was related to both sides, and had kept aloof from the fight, watched it, his heart filled with sadness and pity. At last, unable to stand the senseless carnage any longer, he leapt between the ranks, yelling : " Stop it ! End it ! Each side retire ! " Startled at this apparition, the fighters actually retired without striking one further blow. Nunuku then gave the further command : " Follow me ! " which they obeyed also. When still only a few yards from the battlefield, Nunuku said to one party : " You sit here ! " and to the other : " You sit over there ! " Then he ordered all arms to be stacked in the centre, and fire to be lit into which the arms were hurled. After this, Nunuku demanded that both sides, as a sign of peace, should rub noses—the Maori way of greeting—and should be friends for ever. He added the following admonition : " Never again let



Stern View of a Moriori Waka or fishing boat.

there be a war, as this day has seen ! From now on forget the taste of human flesh ! Are you fish that eat their young ? "

However, he did not gain his aims to their full extent, although the warriors saw that his words were wisely spoken. They contended that at times men grow angry, and that during such anger they feel the desire to strike at each other. It was therefore agreed that they might strike, but only with a rod the thickness of a thumb and the length of an arm. At the first sign of blood being drawn, they should consider honour satisfied. The legend which records all this does not state whether there were any dissenting members at the meeting, but it is recorded that the curse of Nunuku : " May your bowels rot the day you disobey ! " made a deep impression on all. Thus the hatchet was buried, for good or ill.

History shows that it was buried for ill. The pledge given to Nunuku was observed so strictly that later the Morioris refused to take up arms against their real enemies, which in the end brought about the extinction of the pure-blooded Morioris.

In 1791 the islands were sighted by Lieut. W. R. Broughton, commanding H.M.S. *Chatham*. He was a member of the expedition sent out under Capt. George Vancouver to complete the survey of the neighbourhood of New Zealand, originally started by Capt. Cook. The log of H.M.S. *Chatham* gives an account of the natives, but the account of the Europeans given by the natives is much more interesting.

They tell the following story : When Broughton and his men arrived, the Morioris of the neighbouring villages came out in amazement to ascertain the nature and habits of these strange creatures. Noticing the sailors smoke, they remarked, " See, like Mahuik (a god),

fire proceeding from their throats." The rigging of *Chatham* was looked upon as big nets. But what puzzled them most was the question : Are these strange creatures men or women ? As they seemed to be quite amiable, the Morioris touched them. They decided in the end that the visitors were women. Some bolder natives thereupon tried to take hold of them and drag them to their homes in the bush above the sea. In order to frighten them and stop this dangerous game, the sailors fired into the air, whereupon the Morioris said to each other : " Hear the crack of the kelp of their god "—alluding to the report made by threshing the long leaves of bull kelp.

A Fiendish Plan.

The tragedy that brought about the final downfall of the once proud Morioris started one hundred years ago in 1835, rather insignificantly. Two Maoris, who had worked on a whaler, told their tribes in New Zealand after their return home, about the prolific supply of fish, ducks, and other birds in the Chatham Islands. As the natives were quite peaceful and could be easily subdued, they advised their tribe to go down and capture the islands. Enticed by this report, some Maoris conceived a devilish plan, and did not hesitate to execute it. They seized the whaler *Lord Rodney*, lying near Wellington, held her mate as hostage in their village, and forced the captain to take aboard about 500 natives—men, women, and children—as well as the necessary supplies. On landing them on Rekoakoa the captain tried to escape with his ship, but the natives forced him to go back to New Zealand, and to return with a number of canoes and another 400 persons.

According to native accounts, when the Maoris arrived, the Morioris called a gathering, and some of them were in favour of driving the intruders away. They could easily have done so, for at that time they numbered about 2,000. But the majority were in favour of observing the centuries-old law of Nunuku against bloodshed. Nunuku—if he lived at all—certainly had given his law to end internal strife, only. The Morioris, then, dispersed to their villages, and the intruders, not encountering any resistance, set out to subdue the island. In order to emphasise their conquest, they killed about 200 of the Morioris and ate some of these. The surviving aborigines were more or less enslaved.

Enslavement led to a rather quick decline of the unhappy captives. It was perhaps not so much the slaughter of their comrades or the ill-treatment of themselves that broke their spirit and took away their will to live. The Maoris had found out that the Morioris were a very *tapu* people, and when once their *tapu* was infringed, misfortune overcame them quickly. (This *tapu* signifies more or less the same as the well-known word " taboo "). The Maori masters, fortified by this knowledge, ordered their slaves to do things that infringed these religious laws. The Moriori, unable to offer resistance, would obey as long as his master was in sight, but in his heart he felt that death must be his lot for sinning against the *tapu*. Often when the master turned his back, this fear became certainty. Many a slave did not report for work the next morning after a *tapu* infringement, and when the master in a rage went to the *whare* (hut) of his man, he found the slave dead, killed by fright and remorse.

The advent of missionaries and other white settlers bettered the lot of the Morioris in that they no longer had to run the risk of being killed by their masters. The Chatham Islands were in 1842 added to the colony of New Zealand, and in 1855 a resident magistrate was appointed. Gradually the Morioris regained their freedom, but it was only in 1863 that a general manumission of all slaves was declared. A great meeting was called to make this known to all. There was general rejoicing; but an old grey bearded *tehune a tohunga* (sorcerer or priest) of some reputation, who had never been enslaved, but who had accepted the indignities his race had suffered with a patient and solemn resignation, arose and said : " We are now free ! You have scoffed and jeered at us ; you have forced us to transgress our ancient *tapu* laws ; you have taken from us the land of our fathers ; but this you have not taken from us—the will to die !". So saying, he fell forward, stone dead to all appearance. He was taken to his hut and laid out in state. His people collected for the usual *tangi* (funeral ceremony and feast), but they got the shock of their lives, when, on the second day of the ceremonies, the priest sat up. He was declared to be superhuman. However, a doctor from a warship which had arrived during the commotion, examined the resurrected man and declared his case to be a simple cataleptic fit, assumed to manifest supernatural power. This pronouncement did not convince the natives, who stuck to the belief that the priest had divine qualities.

The Last of the Morioris.

At the time when this happened, the number of the Morioris had become only a fraction of what it had been thirty years before. The government, however, took more and more upon itself the burden of looking after their well-being, and in 1870 reserves of land were allotted to them. But intermarriage with the Maoris had aided the hardships in thinning the ranks of the full-blooded Morioris. The intermarriage took such proportions that in 1931 the last pure Moriori died. He left a large family of very mixed blood, as his wife had had European and Malay ancestors.

The Natives of Tasmania.

By N. W. Gregory Walker.

The last of the Early Stone Age races disappeared from the earth when the Tasmanians were exterminated in the 19th century. The story of their latter years is not too widely known and the comparative plenty of the traces which they have left should be of great significance to anthropologists.

TASMANIA is a fascinating island which is too little known. Not only is it so far from England, but it is at a dead end. Between Hobart and the polar ice there is nothing but the tiny speck of Macquarie Island ; and that is a thousand miles away. Although Van Diemen's Land (as it was first named) was settled just after Sydney, it is still not fully explored. One of the present writer's first experiences of it was to stand on the edge of a mountain that fell three thousand feet sheer to a valley filled with trees, which grew through a road, afterwards disused, that had been made in their midst in the time of Sir John Franklin. Looking away for scores of miles, there was nothing to be seen but tumbled masses of mountain peaks. Down the Island, between Hobart and Launceston, runs a main valley, and there are others following the rivers, especially in the south-east and north. In the rain-drenched south-west and west, however, there is scrub so dense that the explorer can make little more than a mile a day. If he meets with a patch of " horizontal scrub," he will clamber over the tree tops ; and woe to him if he falls through. Should the obstacle be bushes of *bauera*, these will be so dense that he may think it best to get past by lying down and rolling over them !

Impenetrable scrub, or " myrtle " forest, typical of the rainy country on the West Coast of Tasmania.

Tasmania may be likened to a wedding cake, with the coastal fringe representing such parts of the dish as are uncovered, and the cake itself rising in two stages, until one reaches the plains and peaks above the forest line. The " Western Tiers " and the " Steppes " are terms in everyday use. In contrast, and near the chief towns, are bits of farm and orchard country which, with their old stone houses, might be found in rural England.

The foregoing is not really a digression, as it is necessary to understand the country in which the aborigines lived. In a search for traces of them, let us first pass to one of the miles-long East Coast beaches, backed by sandhills. The tops of these last are constantly changing and, if the searcher plods over them after a storm, he may come on a "sand-blow" where tons of sand have been blown away, exposing the hard subsoil. Lying here, on the yellow pan, are round and flat stones, which must have come from a distance ; together with lumps of iron oxide, masses of oyster shells, seal and other bones, and, best of all, some chipped-stone implements. All, even the ashes of the fire, looks as fresh as if the happy picnic party had moved away a week or so ago, and it is hard not to feel that bright black eyes may be watching one from the bushes.

Not one of the folk who made the fire is now alive. Only a few years ago the writer was speaking to an old lady who remembered, as a child, going for walks with Trucanini, the last aboriginal survivor, who died in 1876. Such a disappearance is a tragedy, as we had here a real people of the Early Stone Age. They went naked, smearing their bodies with grease and clay, and so treating especially their hair. This was not straight, like that of the mainland natives, but woolly—or at least kinky—as with the Papuans. It is quite likely that they came from some Negrito stock and far away, stopping their voyage at intervals on the east coast of

Australia, and afterwards losing their craft of canoe building, which, being a primitive people, they would not recover. As to the overland theory of their origin, it can only be said here that it is a long while since Tasmania was joined to the mainland, and that she has no trace of that ancient Australian animal, the dingo.

The food of the natives consisted of various animals, birds, eggs, roots, fern shoots, seaweeds, and fungi; besides crayfish and shellfish in great quantities; but never scale fish, which seem to have been the object of a curious taboo. Their shelters were seldom more than mere breakwinds. They carried fire about, but there is no proof that they could make it. Their weapons were whiplike spears, too finely tapered for the use of a throwing stick, short throwing-clubs, and stones. They knew nothing of the boomerang, and never used a handle for their tools. Yet to regard them as unintelligent would be a bad mistake.

The stone implements are not hard to find if one knows how to set about it. In prospecting for them one must put oneself in the native's place, and then look for what he, one imagines, would have considered a good camp site. His first requirement was drinking water, and he liked to sit over it on a warm sandy bank with a sunny north aspect. The writer has found a camp by a little stream, where he could have filled a barrow with worked stones on the one bank, but, on stepping across the water to the opposite slope, he could hardly get one. By the sea, a rocky headland is a good mark, as rocks mean shellfish, and the native seems to have liked to get a lookout. One other thing is necessary in all cases, and that is that—as is usually the case—some kindly farmer shall have ploughed the soil. If not, the implements will be there, but underground. There are to be remembered, of course, the "blows" on the sand dunes first mentioned. These will not so much provide regular camp sites as remains of separate meals. Given the above conditions, either in the valleys or along the coast, the searcher should have no such thing as a blank day. By the way, a "kitchen midden," which is all shells and ash, will hardly give any implements at all.

[*Photograph by R. Gregory Walker.*

An aboriginal camping-site on the East Coast of Tasmania.

The Tasmanian stone tools are often called "flints." This does no harm if it is remembered that there is no true flint in the island; which seems curious, as it appears to contain somewhere almost every form of rock. Another excuse for the name is the extraordinary likeness of the implements to European forms. The material most in favour was chert, a baked mudstone that is almost as good as flint; though the Tasmanian used almost any smooth stone that would serve his turn, except igneous rock such as the common diabase or dolerite. The chert may retain its original bluish-grey colour, or it may have weathered to a pretty buff. None of the tools was ever ground and, when the flake was detached from the core, any subsequent trimming was almost invariably done on one side only, with sometimes secondary chipping to improve an unsatisfactory edge. Of the uses to which the implements were put it is hard to say much that is definite. We are certainly dealing with a people of scrapers. A good number of specimens, handled somewhat in spokeshave fashion, would be used for trimming spears and pointed throwing-clubs. Others were shaped to be used as planes. Sharp natural flakes would be kept for cutting up kangaroos and other animals. A giant flake will almost certainly have been an axe for cutting rests for the big toe when climbing trees. When Tasman's men saw trees so marked they thought, because the steps were so far apart, that the country must be inhabited by a race of giants. Good specimens of carefully worked flints may be found anywhere, as they were worth carrying about. For one beautiful little specimen the writer was indebted to the house-cleaning of a busy rabbit.

It is common to speak of the native "tribes," but tribal organisation here seems to have meant no more than that groups of families kept to their own territories, within which such families were continually on the move, camping in one spot only for a couple of days or so.

Long marches were not made, nor were they called for. R. H. Davies, who studied the natives closely, writes of them (1846).—" The aborigines are capable of great, but not lasting exertion. They cannot stand continued fatigue equal to a hearty European, nor, what will appear singular, can they, like him, bear constant exposure to bad weather ; when such sets in, they will cower round their fires, under the lee of their break-winds in a sheltered situation, until a change takes place."

It may fairly be doubted whether their number was more than about seven thousand at the outside. There is, of course, the evidence of the shell mounds. On the West Coast there are heaps of shell and ashes perhaps thirty feet high. The largest midden, at Swanport, on the East Coast, covers about ten acres, with an average depth of about ten feet. That is big ; but oyster shells make a fine pile in a short time. We still need evidence of stratification of the implements. The writer has made a number of searches along the East Coast, on Schouten Main and Island, Forrestier's and Tasman's Peninsulas, and Bruny Island, and could never escape a strong feeling that the natives, if they existed in large numbers, should have left more debris. The same applies to the collections of stone tools on the camping grounds of the Midlands.

The Start of the Trouble.

One of the first questions that one is inclined to ask about a primitive people is, " Are they savage ? " : that is, fierce or bloodthirsty. One who had the best opportunities for judging the Tasmanians was a private of the Royal Marines, who arrived in the Colony in 1804. He was employed in shooting game to augment the scanty provisions of the young settlement. For five years, he once said, he never slept in a bed, and in very wet weather would pass the night in a tree under a kangaroo skin. With two helpers he was the first white man to penetrate many parts of the Island. Seldom carrying firearms, but using dogs to run down the kangaroo, he often came across parties of the blacks, in whom, he said, " there was then no harm." Soon, however, came the pressure of the whites ; and it was the picked native hunting grounds—that is, the river valleys—that the settlers wanted for their farms. Here the blacks had been accustomed to burn off the scrub in order to bring on a growth of young feed. Smoke must have been a common sight in undiscovered Van Diemen's Land. When the fresh shoots attracted the game, the natives gathered together for a big drive. The whites, with guns and dogs, so increased the killing that a writer of as far back as 1810 noticed a decline in the numbers of emus and kangaroos. When to the irritation of this

On the left is Jack, a native of the North-West Coast of Tasmania ; on the right Manalangana, Chief of Bruny, the father of Trucanini, last of the Tasmanians.

was added the brutality of escaped convicts, stock-keepers, and sealers, it will be clear that the position was impossible ; and to expect the blacks to keep to reservations in the mountains, and live by digging for wombats, was mere foolishness.

Now we may turn to the report of a coroner's clerk, who says, just before 1830:—"Not less than 121 outrages were committed in or near the district of Oatlands alone. A great number more, not included in the 121, were recollected after the report was sent in to the Government. Within a short period, Mr Anstey, coroner of the district of Oatlands and Bothwell, held no less than 28 inquests on the bodies of men, women, and children, victims of the blacks These 28 are exclusive of Matthew Osborne, of Four-square Gallows, and many others, on whom no inquests were held, as they were murdered before coroners had been appointed." Probably on the East Coast the position was worse. Lonely stock-keepers were murdered with monotonous regularity, but, being assigned servants, they could easily be replaced. Often they deserved their fate.

The vindictive feeling between black and white became so acute that the resulting condition is known as the Black War. And here is a fact that is not known ; the blacks were winning. More whites fell from spears than did natives from bullets. But even then the natives killed few women and children. It was, in their view, not fitting that women and children should take part in or suffer in warfare.

Still, such was the terror, that Governor Arthur (who, though not generally liked, was an earnest and most capable man) put 5,000 men in the field, out of a population of 30,000, and kept them there for two months. His object was to carry out, through the south-east of the Island, a great drive, which came to be known as " The Black Line," with the object either of capturing all natives within the cordon, or of pressing them across East Bay Neck into Forrestier's Peninsula.

The mixed army of regulars, settlers, and good-conduct convicts captured a man and a boy. When the net was drawn at the Peninsula, not a black was to be seen.

It seems amazing ; but there were expert bushmen in the Line, and anyone who has seen some of the country that had to be gone through will wonder both how the men were kept provisioned and how they managed to keep in touch. Nor was the effort useless. The blacks had been chased for weeks, and been unable to hunt and make fires. For all they knew the white men might repeat this process indefinitely, and so, by another wonderful bit of work—this time to the credit of a single man, who took his life in his hands—they were, in a short while, persuaded to come in. There were found to be only a few hundreds left.

If Trucanini was, as has been thought, seventy-three years old when she died in 1876, then she was born in the year of the founding of Tasmania, and saw the whole agony of the disappearance of her people. They were shot like animals ; and yet they were far from being such. In their last days they showed real affection in return for any kindness, as well as an intelligence that amazed all who had to deal with them. Why was it that these poor creatures vanished with such dreadful suddenness ? It seems that, when still at large, those who were not shot by the whites largely destroyed each other for, being driven from their own hunting grounds, they were forced to trespass on the territories of other tribes ; and that meant war. When in captivity, they were treated with every kindness, but it was thought necessary to dress them in voluminous early Victorian clothes (they looked so dreadful in them), and the direct cause of their deaths was usually pneumonia.

We have a description of them, after they had been moved to Flinders Island, sitting hour after hour, tears often running down their faces, as they gazed across the sundering waters at the dim hills beneath which lay their beloved camping grounds We offered them life on our terms, but they could find no use for it, and so they died ; if only because they felt, however dimly, that their time had come.

(*Continued from next column*).

arise as is shown by the verse of Quinn, Ogilvie, and Lawson. The country spirit is just as strong in them, but a truer poetic insight enables them to dress it in silks instead of the rags of the old " back-blockers." Among contemporary poets one must mention Sir Archibald Strong, Dorothea Mackellar, and E. V. Palmer.

Of these, Palmer is certain to be remembered by posterity, for his best verse is infused with a richness of colour very near to Coleridge's *Ancient Mariner*.

Australian Poetry.

By Peter Irving.

THE subject of Australian poetry always seems to conjure up one name—that of Gordon. I think, speaking as an Australian, that this is unfortunate, because, although he has greatly influenced our poets, he does not derive his inspiration from his surroundings, but rather from English and medieval sources, as is clearly shown in his *Joyous Garde* and *Britomarte*.

Kendall, who modelled himself on Gordon, occasionally rose to poetic height, but never produced anything equal in power to *The Sick Stock-Rider*. Kendall suffered from his complete lack of critical ability and his output is very analogous to that of James Hogg.

The truly native era begins with G. E. Evans, whose *Australian Symphony* stands out in fine relief and tells a stirring continent to sing about itself and break away from the false gods of foreign inspiration. The opening stanza runs as follows :

" Not as the songs of other lands
Her song shall be,
Where dim her purple shore-line stands
Above the sea ;
As erst she stood, she stands alone ;
Her inspiration is her own.
From sunlit plain to mangrove strands
Not as the song of other lands
Her song shall be."

Following on the trail that Evans had opened up there comes a host of singers that are typically Australian : they are the " Bush-Balladmongers " or the " Wattle-and-Bottle " School. Most of them work on the stations, and all their energies are devoted to a fierce and bitter struggle against Nature. One can see a lonely figure on a horse carrying out the hated job of boundary-riding. He will not see a human being, either white or black, for three weeks. Small wonder then that his verse will contain much that is bitter and withered, but all through it there runs the saving grace of a jaunty good humour. The following quotation is authentic and typical :

" It's grand to be a squatter
And sit upon a post
And watch your stock of ewes and lambs
All giving up the ghost."

It is not great poetry as the English understand it, but it is cruelly alive. To find anything parallel to it you have to go back to the old Scottish ballads of the 16th century.

What Chaucer has done for English literature, these balladmongers are doing for us, for out of this heterogeneous assembly some true poetry is beginning to

(*Continued in the preceding column*).

The Papuan Element in the Pacific.

By L. Evelyn Cheesman, F.R.E.S., F.Z.S.

Recent Melanesian research has thrown new light on the population of the Pacific Islands, both as regards their fauna and their flora. Miss Cheesman's article emphasises the importance of New Guinea as a distributing ground for species. Current exploration may very well result in the accumulation of still clearer evidence.

PROBLEMS connected with the fauna and flora of Pacific islands are complicated and baffling, but for that very reason are of peculiar interest. We see the largest area of water on the earth's surface dotted at intervals by archipelagoes, some isolated at great distances from continents or from one another. These are all populated by species of animal and plant life. The problem is whence these species derive; whether their presence is due to former land connection, or to more recent transmission across water from continents, either by migration, or by wind, water or other incidental means of dispersal.

Knowledge of the distribution of species of insects would undoubtedly contribute much valuable evidence on which to base theories, but our knowledge is scanty owing to lack of sufficient material. Of recent years certainly more systematic collecting has been carried out on some islands, and various faunistic and taxonomic papers have been published, but a great deal remains to be done.

Continental and Oceanic Islands.

Wallace grouped islands in two classes, continental and oceanic. In the Pacific Ocean it is generally accepted that the continental islands have retained the greater part of their original fauna, while oceanic islands were fortuitously colonised, as they rose from the ocean bed, by adventitious species. It is considered that even if the incessant rising and subsiding of land had at any time formed connections with continents, that this was at too early a period to be utilised by any but archaic types which are rare.

A serious difficulty is the lack of stratified rock to provide geological evidence. Where this exists rock specimens have been more or less spasmodically collected and studied, but far more intensive as well as comprehensive work is needed.

There have always been zoologists to disagree with the theory that the population of mid-Pacific, oceanic islands is due to migration. It has been pointed out that, even though geological evidence appears to be lacking, there must be some other explanation to account for certain elements in the fauna and also in the flora. The majority of species on archipelagoes of the west and mid-Pacific are recognised as derived from the north-west; and the presence of older forms side by side with more recent and endemic forms is supposed to be due to the migration having been in waves, and at different periods. There are also species which are considered to be confined to the Pacific Islands, and to have either migrated or been transported from group to group. They are referred to loosely as Polynesian or Pacific Island species.

Among such are two species of ophions of the genus *Hemicospilus* occurring on several archipelagoes, *H. samoanus* and *H. nocturnus* first described by Kohl from Samoa. I took representatives of both species in the centre of Papua at 4,500 feet, as well as on different islands of the Society and New Hebrides groups. There is no character on which it is possible to separate individuals, one cannot distinguish specimens from Tahiti from those found on the mountains of Papua.

These are not migratory insects, nor can one detect any point of their life history when they would lend themselves to accidental transportation. Those two species then are not confined to the Pacific but are pure Papuan, and have probably been established for a long period. They are not an isolated case among the Hymenoptera, and there will no doubt be similar examples in other orders when the collection from Papua has been worked out.

It is not suggested that all so-called Pacific species will be found to be Papuan; but that the Papuan element will have to be reckoned with by future scientists who will be in a better position for dealing with these problems, and that it is not easily explained by the theory of migration.

The New Hebrides.

If even on mid-Pacific islands the Papuan element is marked, it is not surprising that it is stronger in the archipelagoes to the west, such as Samoa and Fiji. In working out my own groups of Hymenoptera from the New Hebrides I delayed publishing results because, although suspecting a Papuan origin, we had no material from the central regions of New Guinea. There are, for example, certain Megachiline bees of the New Hebrides which have no affinity with the Australian or Malayan bee fauna, and only indirectly with that of the Orient. They prove to belong to an endemic New Guinea genus.

The reason why the zoo-geographical limits of Papu-

asia have any bearing upon questions of the insect fauna of mid-Pacific islands is because of this strong Papuan element even on the oceanic islands, which can be traced through intervening archipelagoes to the country of its origin.

Papuasia is strictly speaking a division of the Austro-Malayan faunal sub-region. It is zoologically distinct from the Celebes, and also from Malaya although the three faunas derive from the Oriental region. Extension of land to the N.W. was probably through the Philippines and S. China and not through Malaya, if we are to accept the evidence of the nearest affinities of New Guinea insects. It seems to suggest that Wallace's faunistic line will some day be moved east of the Celebes. Or if the Austro-Malayan sub-region were raised to the rank of region there would be two sub-regions—Papuasia and the Celebes.

Papuasia consists of the very large island of New Guinea, with small islands to the N.W., Waigeu, Mysol, Ceram, Buru, Key, Aru, and others; groups of islands to the S.E., the Louisiades, d'Entrecasteaux, and Trobriands; on the east, Admiralty Islands and what was known as the Bismarck Archipelago, now called New Britain and New Ireland; connected by the Neu Lauenberg coral islands, now called the Duke of York Is.; also the Solomon Is., and the New Hebrides. In addition two very interesting areas of Papuan tropical forest occur in North Queensland—the insect fauna of which is pure Papuan—sharply delimited by the dry Australian bush, and extending from Cooktown in the North to a little south of Hinchinbrook Islands.

The Geology of Papua.

From the rather sparse geological papers on New Guinea, and particularly the general paper by the late Professor Edgeworth David, the history of New Guinea briefly is this—the late Miocene-Pliocene fold ridge which extended to New Caledonia, and in the other direction formed the Himalayas and the European Alps, raised the central ranges of New Guinea from the Miocene Sea. At the same period all the land to the S.W. of the ranges was raised when the faulting took place, and later was weathered to its present altitude.

But New Guinea did not first come into existence at that period, for there is a far older range near the N.E. coast with Mt. Cyclops and Mt. Bougainville; and another old granite range, the Arfak Mountains, on the peninsula.

Botanists recognised some time ago that New Guinea is a distributing centre for species; also that what were once considered Polynesian forms and endemic Queensland forms are Papuan.

With regard to the geological evidence of connection with Queensland we have the shallow sea of the Torres Straits whose bed to-day would have to be raised only seven fathoms in order to make a land bridge, while ten fathoms would form a wide belt. According to Edgeworth David it was during the late Pleistocene that the Straits were again open; either because of subsidence of land, or through the level of the sea being raised after the melting of the ice. At the same period the Great Barrier Reef started its series of elevations.

Some time, then, between these two periods—the late Miocene-Pliocene and the late Pleistocene—the Papuan species, which are conspicuous in Queensland, crossed over and spread wherever conditions were favourable.

An interesting example of this is found in terrestrial molluscs. In 1892 Charles Hedley drew attention to the fact that the only operculate snails found in Australia belong to three Papuan genera restricted to the N.E. coast of Queensland, whence a few species have spread southwards.

Oriental Connections.

The scorpions supply evidence of the former connection of Papuasia with the Oriental region. *Hormurus caudicula* has a distribution from New Guinea to mid-China through the Moluccas and Philippines, with two Papuan sub-species. Of the remaining six species of New Guinea scorpions, four are endemic. The only two species recorded also from Malaya have a wide Pacific distribution and are known to be carried on ships. I have myself on several occasions taken them on wharves, and they are very commonly found in luggage and packing cases.

Among frogs, the Austro-Oriental family Hylidæ has a Papuasian genus *Hyla*, species of which are recorded from nearly all the islands east and south of the Celebes, as well as the archipelagoes east and south-east of New Guinea, including the Solomons.

The distribution in Papuasia of the Mesostenini, a tribe of Ichneumonoidea, is of interest as evidence of the former connection of land, although the revision of the Papuan genera is by no means complete owing to lack of material. Of thirteen genera of Mesostenini of Papuasia five are Oriental, represented in China, the Philippines, and the Khasia Hills in India. There are seven endemic genera with endemic species on the smaller islands and in Queensland; and one genus recorded only from Queensland, which may be represented in New Guinea. The material is scarcely adequate to permit generalising, but there are 64 good species; and although I have examined a considerable amount of material from the Indo-Malayan sub-region, the genera appear to be quite distinct. The Mesostenini are a useful basis for investigation of distribution for many reasons. In the

first place they are very richly represented in tropical and sub-tropical forests. They need special collecting, and the amount of material in museums is in no way commensurate with the prodigious number of species which exist. Secondly, their structure and habits preclude their being subject to dispersal by wind, for they are heavily built insects and accustomed to flying low. The females parasitise the larvæ of other Hymenoptera and of Coleoptera belonging to wood-boring species. The habitat of the hosts in fallen trunks or decaying timber keeps them near the ground. When pairing or seeking the hosts they fly low, through glades and forest trails. Therefore such insects are not liable to be caught in strong, upper currents, like those that fly upwards for pairing and are light in form.

Typical taro gardens in New Guinea (left) and the New Hebrides (right). The difference between the partially cleared ground of the first and the wholly cleared space in the second is immediately noticeable.

Among insects, several very important groups are not represented east of Fiji, including several tribes of Hymenoptera and the entire sub-order of Sawflies; *Cicindelidæ* and *Cassidæ* in Coleoptera; and entire families of Hemiptera and Homoptera, notably freshwater bugs, *Veloceipedidæ*, *Nepidæ*, *Naucoridæ*; in the Microlepidoptera, *Ægophoridæ*, *Pterophoridæ*, etc. Two important genera of spiders are not represented: nor are the scorpions, or frogs. This is a stumbling block to those who would postulate a theory of land connection in the past between Papuasia and the mid-Pacific.

The reason why the vast area of New Guinea retains its fauna and flora intact is chiefly due to the fact that the destructive animal, Man, is not able to make much impression on those immense forests.

Of especial interest in New Guinea was the opportunity-species association of cleared areas, compared with what one sees on Pacific Islands. In the New Hebrides, for instance, when the large native gardens are made for taro and tobacco the ground is cleared of all trees and their roots. The forest does not reclaim such areas but the ground is monopolised by certain weeds, chiefly of Indo-Malayan origin, which have spread right across the Pacific, on which are found introduced insects and species common on the coast. There are so many of these areas that they intersect the forest which must eventually be destroyed.

In New Guinea, on the contrary, the forest is too vast to admit this type of vegetation or of insects, and the taro gardens are only partially cleared, the tree stumps being left to grow again. In the uplands, where former villages have left whole slopes of cleared ground, only a few alien plants are to be found. The sunshine-loving species of plants and insects of the forest, found in glades formed by the uprooting of trees, come out into the open on these old village sites.

One exception is the Aculeate Hymenoptera, many of which take advantage of banks in road-cuttings and well-trodden paths, all made by man, while avoiding similar banks caused by natural landslides. We therefore see alien types assisted to break into established species association through the interference of man.

The Chinese Art Exhibition.

Enthusiastic press reports have catalogued the beauties and wonders of Chinese art displayed in London. Our Ethnographic Correspondent treats the Exhibition from a different point of view, the importance of which has perhaps been neglected hitherto, so engrossed have we been with the pure æsthetic value of the objects shown.

THE International Exhibition of Chinese Art, which opened at the Royal Academy of Art, Burlington House, London, on November 26th, is more than impressive in its effect: it is overwhelming. Not even a prolonged series of visits extending over the whole period of exhibition could hope to exhaust its interest. Over 3,000 exhibits have been brought together, the nucleus a generous selection from the imperial treasures of the Forbidden City, many of them made exclusively for palace use, which has been lent by the Chinese Government, the remainder drawn from the most important public and private collections in Japan, the United States, Great Britain, France, Sweden, Russia, Austria, Germany, Turkey, the City of Danzig, and Egypt.

So far as possible the exhibition, which is arranged in chronological order of dynasties, has been made fully representative of Chinese achievement in all branches of art. Painting, sculpture, and carving in ivory, jade, and other material, ceramics, metalwork, textiles, and calligraphy. It is almost unnecessary to say that such a collection, especially in ceramics, paintings, and that peculiar and characteristic *chef-d'œuvre* of Chinese artistic production, carved jade, is not likely to be seen again, at any rate in the life of the present generation. Considered merely as a chronological sequence of culture extending over thirty-five centuries from the Bronze Age (1766 B.C.) down to A.D. 1800, the exhibition is a remarkable record; but when the high æsthetic and technical achievement throughout is taken into account, if affords an impressive view of the history of Chinese civilisation.

In this long period, notwithstanding extraneous influences impinging upon Chinese culture from time to time by invasion or otherwise, of which the effect is here made fully apparent, the characteristic Chinese modes of thought and treatment not only appear early—notably in the bronzes of the Shang-Yin dynasty (? 1766-? 1122 B.C.)—but they endure throughout to the latest period, however they may be partially masked at times.

A screen in cloisonné enamel, about 6½ feet high: period of Ch'ien Lung (1736-95).

When, as in this exhibition, the principles and standard of selection in a collection of cultural material have been purely æsthetic, or historically significant in relation to artistic development, experience of non-European art forms has taught us that the successful accomplishment by æsthetic standards of a people, a period, or a school, is no index of a general level of culture. Such, for example, is the inference to be drawn from the sculptural art of West Africa. Yet in the eyes of the student of cultural development, this art can be judged and evaluated only in reference to the cultural *milieu* in which it was evolved. Regarded from this point of view the exhibition of Chinese art, while it is in no way a review of Chinese cultural history, seems to demand a reorientation of Western ideas relating to Chinese civilisation. Only in this way is it possible to render intelligible the mental attitude of the Chinese to other peoples—the attitude indicated, for example, by the record of the Chinese annalist of the 18th century, who reports the visit of "barbarians," when Lord Macartney's mission came to the Chinese court in 1794. This much, at least, must be conceded—Chinese cultural advancement was even greater than has been realised, and it attained a high standard at a much earlier date than was known until recently.

Aesthetically the interest of the exhibits at Burlington House culminates in the ceramics and paintings of the Sung dynasty (A.D. 960-1279). However individual tastes and preferences may vary, it would be difficult not to admit as an abstract proposition that these represent the apogee of Chinese artistic accomplishment, even though to some they may seem less characteristic of China than later products with which hitherto there has been greater general familiarity. And it is perhaps not without significance in this connection that it is only since the Chinese themselves have exploited the finds of sepulchral ritual figures and representations in the Han (206 B.C.—A.D. 220) and T'ang (A.D. 618-906)

tombs that certain qualities, more especially the vital force of Chinese art, have come to be more widely appreciated, though this is not an art that appeals to the Chinese themselves as transcendent. Yet these T'ang figures and the great pottery Lohan, the Buddhist priest in contemplation, all live.

An ice chest in cloisonné enamel of the 18th century.

In the appreciations of the Exhibition which have appeared in the press the æsthetic values inevitably have taken first place ; but its interest and importance are of equal, if not greater moment to prehistorian, archæologist, and the student of religious beliefs. For the last named, in addition to the whole nexus of ideas implicated in the burial of ritual figures of attendants and animals in the tombs, ideas familiar in ancient Egyptian burial custom, there is the evidence in artistic idea and achievement of the spread of Buddhistic concepts to China, carrying with them Greek artistic ideals and technique inherited in Indian art, and of the reforms which followed the return of Chinese pilgrims from the holy places of Buddhism in India with manuscripts and images of the Gupta school of art, here to be seen in representations of Buddha and his disciples, and a whole school of figure presentation in sculpture, painting, and textiles from life size and over to miniature.

The prehistorian, on the other hand, will turn first to the painted pottery, which recent excavation has brought to light in North and Central China, apparently linking up the neolithic age of China with the prehistoric civilisations of the Indus Valley, Mesopotamia, and Southern Russia ; then to the remarkable series of ceremonial bronze vessels, carved ivories, jades, and stone objects of the Bronze Age of the Shang-Yin or early Chou (? 1122 B.C.) dynasties, some with inscriptions in an early form of writing from which is given a basis of reality to the shadowy figures of the emperors of the traditional annals extending from this early period back into the third millenium B.C. The highly developed technique of these early artefacts, but more especially of the bronze vessels with their elaborate ornamentation, and the early employment of inlay of gold, silver, and precious or semi-precious stone, is indubitable evidence of a long pedigree of cultural and technical development, which, if it cannot confirm, does at least lend some support to the traditions of the annalist. Here, too, it may be mentioned, if at the risk of reviving ancient controversy, the student of culture-contacts will find material for thought in decorative forms on these bronze vessels, which suggest an affinity with the Pacific or with Central America, though discrepancies of date would appear to preclude anything more than a common ancestry or a convergence.

A Guide to Chinese Art.

Most of us are familiar with Chinese art in its various forms, but very few of us have been able to appreciate to the full its wealth of design and meaning. Books on the subject have been highly priced, and even these books often fail to show us the aim of the men who designed and made these strange and costly treasures of the collector. The slender volume entitled *Chinese Art* (Kegan Paul, 2*s*. 6*d*. and 3*s*. 6*d*.), edited by Leigh Ashton, with an introduction by Laurence Binyon, has told us more about Chinese art than any other book which has previously come into our hands. It has been specially written to help those who wish to profit by that unique Exhibition of Chinese Art which opened in London at the end of November. Painting and calligraphy are dealt with by Laurence Binyon, sculpture, lacquer, and textiles by Leigh Ashton, the potter's art by R. L. Hobson, bronzes and cloisonné enamel by A. J. Koop, and jades by Una Pope-Hennessy. Each section is written in an understandable manner, and the 24 full-page plates are unusually good for close study.

The Problem of Breckland.

By L. Dudley Stamp, B.A., D.Sc.,
Director of the Land Utilisation Survey of Britain.

Though the East Anglian Breckland may not possess much importance in itself, the problems arising from the afforestation which is now going on there are of very wide application. No one is more qualified to discuss these than Dr. Dudley Stamp, and his view of the subject is of the highest importance.

THE name "Breckland" has long been applied to a large area of light sandy soil lying in south-west Norfolk and the adjoining parts of western Suffolk. It stretches from Swaffham in the north almost to Bury St. Edmunds in the south, and from Mildenhall and the border of the Fens on the west to beyond Thetford on the east. In many ways it is an area unique in Britain for it lies in the dry east of England and has at the same time a very dry soil. The summers are unusually hot and sunny and with but little rain, whereas the winters are long in that the period absolutely free from frost is comparatively short. It is not surprising, therefore, to find some affinities between the flora of Breckland and the flora of the steppelands of south-eastern Europe. The surface of Breckland is low—rarely reaching 200 feet above sea-level—and undulating so that the traveller across the area gets wide views of desolate, rolling heathland, whose loneliness is only accentuated by the clumps or narrow belts of twisted Scots Pine, or by the reed-surrounded, bird-haunted shallow meres.

Miniature Saharas.

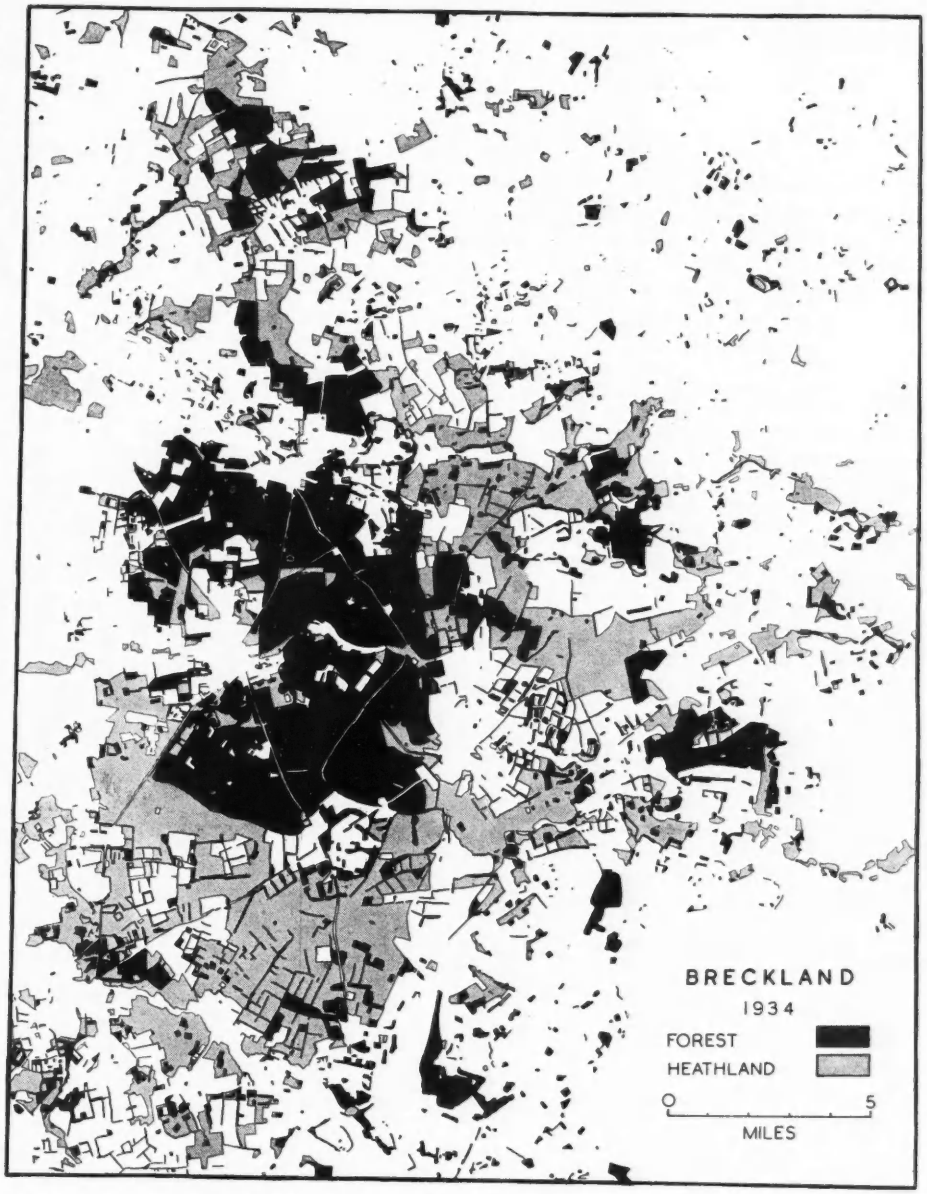
The future of Breckland is a problem of such importance that the Botany, Forestry, and Agriculture sections of the British Association held a joint session at the recent Norwich meeting for its consideration. Dr. A. S. Watt, in outlining the general physical conditions, proved conclusively that the sandy soil is not derived, as has so frequently been stated, from sand dunes on the shores of the Wash when that inlet covered what is now Fenland. He showed that there is a wide variety of soil types from calcareous shallow soil (resting directly on the chalk) through deeper soils deficient in calcium carbonate to very acid podsolised soils. It seems that the area was formerly covered with a very sandy type of chalky boulder clay. When the chalky material was removed by the solvent action of rain water, the sand which remained was redistributed by wind, and there is still much movement of sand in windy weather—producing in the heart of fertile England miniature replicas of the sandy wastes of the Sahara. Though the soils are thus varied, they are all highly permeable and with a small water-retaining capacity. The flora is, consequently, drought-resisting, and four main associations may be distinguished. There are, first, ordinary heathlands, in which heather (*Calluna vulgaris*) is dominant, and, secondly, bracken "brakes." But the unique "grass-heath" of fescue and bent grasses, forming a low-growing mat, is particularly characteristic of the area. On the best soils the mat is close and thick, but, as conditions become poorer, the grass becomes poorer and is largely replaced by the lichen *Cladonia*. Dr. Watt distinguishes seven grades, from A to G, the poorest being almost pure *Cladonia* and constituting the fourth type. This *Cladonia* moor is strongly reminiscent of the reindeer-moss wastes of Tundra lands.

Huge New Forests.

In common with the rest of England, Wales, and Scotland, Breckland has been surveyed by the Land Utilisation Survey according to the scheme which was described in DISCOVERY of October, 1933. The results are shown on two sheets of the one-inch Land Utilisation Map, the northern of which (Swaffham sheet) was recently published,* the southern (Thetford sheet) being now in the press. The larger illustration herewith is a reproduction in black and white and on a much reduced scale of part of the information collected by the Survey. It shows the distribution, at the beginning of the present year, of woodland and forest — including plantations — (in black) and of heathland (in stipple) in south-west Norfolk and north-west Suffolk. The Survey in this area was organised by Mr. J. E. G. Mosby, D.S.O., the honorary organiser for Norfolk, under the patronage of the Lord Lieutenant of the County and with the co-operation of the Forestry Commission and the local landowners. If one draws a boundary line around Breckland so as to include all the major woodland and heathland tracts and so as to coincide as nearly as possible with the distribution of light sandy soil, the area so enclosed is that shown on p. 000, of about 192 square miles—roughly 120,000 acres. Approximately 50,000 acres have been acquired by the Forestry Commission since the commencement in 1920 of the afforestation scheme. The Forest of Thetford Chase (35,411 acres) is the largest of the new forests, and 25,577 acres are already planted. Allowing 20,000 acres for arable

*Obtainable from the offices of the Survey, 18 Houghton Street, London, W.C.2. Price 4*s*.

This map shows the land covered by forest and heath in the Breckland. The area of the great forest of Thetford Chase stands out in the centre. The tinted areas should be compared with those indicating arable land on the following page.



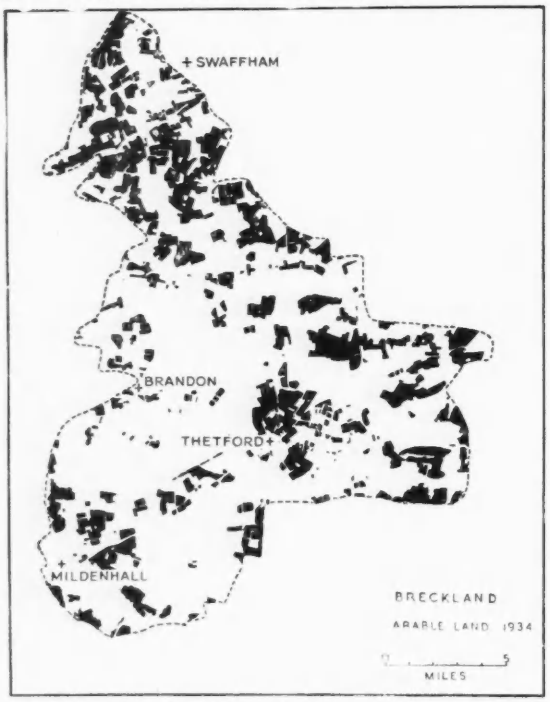
and grasslands only about 50,000 acres of Breckland remain at the present moment as heathland. The bulk of this forms part of the huge private estates characteristic of the area. One by one these estates have been coming into the market for reasons well known to the Chancellor of the Exchequer. Their value lies in the shooting rights, and it is stated that the extensive afforestation is seriously affecting the value of these rights by altering the character of the fauna and will result in the complete disappearance of the estates.

Much criticism has been urged against the policy of the Forestry Commissioners in Breckland. The large landowners are concerned for the effect on shooting; some agricultural economists urge that food comes before forests; naturalists are concerned for the effect of afforestation on the flora and fauna; some lovers of East Anglia are horrified by the substitution of great sombre pine forests for the wide open heathlands, whilst even amongst foresters there is some doubt as to the wisdom of planting conifers exclusively. It is

worth while to examine some of these criticisms.

In the first place the position of forestry in Britain has long been a national scandal. With a climate which is essentially a woodland or forest climate, less than 5 per cent. of the surface is occupied by woodland. This is a smaller proportion than in any other European country, and as a result Britain is forced to import 90 per cent. of her timber requirements. Yet more than a third of the surface of Britain is too poor to be used agriculturally and is virtually waste land. Out of the 20,000,000 acres thus available the Forestry Commissioners plan to plant 1,770,000 acres—less than half the area of the grouse moors of Scotland alone.

It is very instructive to compare the new land utilisation maps of Breckland with previous records, however meagre, of land use in the region. A particularly interesting map of Norfolk is that published by Feden in 1797 from surveys made by Donald and Milne in 1790-94. The heathlands are clearly shown and so are the woodlands. Other areas are shown as small



Map enclosing the typical Breckland area. The tinted arable portions should be compared with those showing heath and forest on the larger map.

enclosures—arable and pasture fields—others are indicated as common arable fields. The surprising lesson of this map is the large area under cultivation in 1790-94; the woods are few and small—patches of oak woodlands or strips of Scots pine planted to shelter a large estate. The heathlands are far less extensive than they were in 1920 before the Forestry Commissioners started work, though their eerie loneliness must have been emphasised by the numerous "gibbets" and "gallows" shown on the map! Why has so much land gone out of cultivation? As explained in the August number of DISCOVERY, there is much light land in the United States which ought never to have been ploughed and which, through cultivation, has been exposed to very serious erosion. It is probable that the same is true of Breckland, and it may be urged that the present policy of afforestation is the only possible way of checking this ruinous erosion. The failure of extensive agricultural experiments during the War is a further answer to those who urge attempting cultivation of Breckland.

Whatever their reasons elsewhere, the Forestry Commissioners are forced to plant conifers in Breckland. Attempts to establish hardwood plantations have failed, as might be expected in such highly podsolised soils. But when coniferous forests have become established the amelioration of soil conditions will later permit the planting of native hardwoods.

There remains one all-important aspect of the future of Breckland. Although it is almost impossible to say which areas are original and which have at some time or another been cultivated, it will be a national calamity if some part is not preserved in its present form for our descendants. What a magnificent memorial of the British Association's visit to Norwich in 1935 would be the acquisition of a typical area—such as the carefully studied Cavenham Heath, so long used by the Cambridge botanists as an outdoor laboratory—by the National Trust. May we appeal to the generosity of the landowners of Breckland?

Conifers and Wild Life.

In a letter to the Council of the New Forest Association, published in their Report, Mr. W. Parkinson-Curtis, President of the Society for British Entomology, deals with the growing scarcity of lepidoptera in the Forest. He thinks that pheasants are some of the worst enemies of butterflies, and many entomologists will agree with him. But he also contends that the close planting of conifers must be inimical to insect life—which is certainly true—and he urges that our native deciduous trees should be planted instead so that the New Forest may once more be an open "English woodland."

He considers that the collection of specimens by entomologists cannot be the cause, as some species, such as the White Admiral and the Comma, have actually become commoner, while others, like the Large Tortoiseshell, are now rarities where they once abounded.

Mummies in New Guinea.

By the Rev. G. F. Cox.

The discovery of mummies in a New Guinea cave suggests remarkable parallels between Melanesian and other cultures. The author, as Archæological Correspondent of the "Sydney Morning Herald," ranks among the foremost observers of the progress of archæology in Australasia.

SINCE the presence of mummies in New Guinea was reported last July by Dr. Atcherly, world-wide interest has been manifested by anthropologists and scientists.

Dr. Atcherly, F.R.G.S., it will be remembered, discovered in the vicinity of Mapos, a village 30 miles south-west of Salamoa, a remarkable group of human forms. In a long cave with a stalactite roof were 67 mummies, with more in the interior uncounted. Most of these were in a fair state of preservation, and bore evidence of having been mummified in a manner similar to that of the ancient Egyptians, but lacking the elaborate ornamental finish of the mummies found in the land of the Pharaohs. One of the figures, from a knock on the head, bore evidence of being killed in battle; and the party were probably the remnants of a tribe defeated by their enemies in the interior and starved to death in the cave, after which their bodies were treated by friendly natives in order to preserve them. Dr. Atcherly discounted the idea of stalactite drippings having effected this preservation, by the statement that the bodies would certainly have decomposed before the slow action of the lime salts from the stalactite drips could have any petrifying action.

Dr. Atcherly with one of the mummies found by him in a New Guinea cave.

The writer at the time commented that this process of mummification was not surprising when the recently unearthed evidences of archaeology were recalled as to a prehistoric contact between Babylonia and Egypt and Australasia. For instance, there is a distinct resemblance between the mourning customs of the Egyptians and those of the Maoris; and the Maori word *tapu* (sacred) is very similar to a Babylonian sacred word. The Egyptians also possessed something very like the Australian aboriginal's weapon, the boomerang.

Prof. Raymond Firth, of the Anthropological Society, London, declared that the discovery was very important, because mummies had previously been discovered on Torres Strait Islands, showing remarkable similarity to those of Egypt. Details were eagerly awaited concerning the funeral services of those responsible for the mummies, in order to have the benefit of the light they would throw on the purpose of preservation and the ideas of life after death.

It would be very desirable for an experienced anthropologist like Dr. Reo Fortune, who is at present working on the Ramu Plateau in New Guinea, to investigate the find with a view to deriving the maximum of value from the evidence, added Dr. Firth.

Interviewed in Sydney, where he is spending his furlough, Dr. C. Mervyn Deland, of the New Guinea Public Health Department, said that the mummies had been found in a limestone cave at a great height above sea level; they were preserved artificially and, as far as is known, were not calcified. They were in such a state of preservation that one of them, on being brought down into a warm, humid climate, was attacked by ants, and special measures were taken for its safeguard. The mummies were found in a sitting position, and to an untrained observer they were strangely suggestive of a relationship with Inca or other South American remains. In the hands of experts, this apparent relationship might be the means of opening up what was at present merely a conjectural chapter of Pacific Islands history.

It might confirm the idea, he concluded, that Polynesia and certain of the South American civilisations might have had a common ancestry in a race originating somewhere in the equatorial regions of Asia and Africa, and that a branch may have been left in the interior of New Guinea.

Book Reviews.

The Ancient World. By T. R. GLOVER. (Cambridge University Press. 6s.)

Dr. Glover's brilliant sketch of ancient history should interest every reader, whether old or young. He observes with sly humour that it is " not a text-book for any known examination," but it abounds in those shrewd comments with which an experienced teacher makes the text-book intelligible. And he emphasises always the importance of the human element and the human love of power and gain which text-book writers tend to ignore or underrate. Thus even those who are reasonably familiar with early Greece and Rome, the Eastern Empires, and the spread of Hellenism in the wake of Alexander's armies, will find Dr. Glover's survey both fresh and stimulating. Like Socrates, he delights in asking questions; he does not answer them but leaves them to excite the reader to further enquiry—and not the least charm of ancient history is that it abounds in such problems, over which scholars still dispute. Dr. Glover rightly shows the value of Greek individualism and freedom of thought. But he is, none the less, ready to admit that the tyrants had their uses in reorganising society and trade; none of them, as he remarks, lasted very long. He brings out clearly the high importance of Alexander's conquests in widening the Greeks' parochial outlook: the state replaced the city, and Greek ideas overspread the known world.

Rome, with her profound interest in law and her efficient methods of conquest and administration, proved to be Alexander's true successor, and her rise is rapidly and accurately sketched down to Constantine's day. The author is concerned throughout with fundamentals—the facts of geography, of race and temperament—and not with constitutional or military details or with dates. Thus his book has a definite bearing on modern as well as on ancient history, and the parallels that he occasionally introduces are as apt as they are interesting.

The Structure of Spectral Terms. By W. M. HICKS, Sc.D., F.R.S. (Methuen. 10s. 6d.)

The pioneering spectroscopic work of the late Professor Hicks is well known. This work is a continuation of his earlier investigations into the numerical analysis of spectra. It consists of a study of the numerical relations between observed frequencies, without any discussion of the findings in terms of contemporary atomic theories. The first chapter of the book deals with empirical formulæ for the term values in series spectra. Later chapters deal with satelloid lines, linkages, and the relation of multiple terms. The book closes with a sketch of a simple dynamical model.

It does not detract from the very great value of Professor Hicks's earlier work to say that the point of view expressed in this book will probably be acceptable to few physicists at the present time. For instance, the sections dealing with the quantisation of the Rydberg correction into multiples of a fundamental unit, the " oun," characteristic of the element in question, are hard to reconcile with current ideas on the subject. It is in particular difficult to conceive how, in view of the discovery of isotopes, any spectroscopic quantity can depend directly on the *chemical* atomic weight of the element responsible for the series emission. The theoretical difficulties of this formulation are discussed by the author, who attributes ordinary spectral radiation to nuclear processes as a way out of the dilemma; in view, however, of modern views on the structure of the nucleus, the objections to this hypothesis seem prohibitive.

The book is, of course, in no sense a text book of systematic spectroscopy, presenting as it does an unorthodox point of view and using a spectral notation and terminology quite different from that in almost universal use to-day. The book is well printed, and the literary executors of the late Professor Hicks are to be congratulated on the satisfactory way in which they have discharged what must have been a heavy task.

N. F. MOTT.

Coral Gardens and their Magic. By B. MALINOWSKI. (Allen and Unwin. 2 Vols., 42s.)

Dr. Malinowski's previous publications have made the Trobriand Islands a *locus classicus* for anthropologists. In this further instalment of their chronicles he has been able, owing to " the vision and initiative " of his publisher, to present his data with a completeness far beyond the reach of most field-workers, even did their notebooks provide a sufficiency of material.

A brief account of Trobriand scenery and society introduces " the essential Trobriander . . . first and foremost a gardener." Readers will be grateful for the plans and photographs, and not least for the " analytical table of contents," in their subsequent journeyings through the gardens. These, the pride and joy of the Trobriander, as well as his principal means of subsistence, are devoted chiefly to the cultivation of *taytu*, a variety of yam, but produce also taro, coconuts, and bananas. The whole cycle of gardening activities is described in detail, from the initial choice of site to the triumphant harvesting and display of the crop and its final distribution according to customary law. Each stage is accompanied by its appropriate ritual, including " the magic of prosperity," designed to prevent hunger, for " what would be the good of harvesting splendid crops if they were eaten in a hurry because the people had too much desire for food ? " The interaction of all this upon Trobriand psychology and sociology is also discussed, and special stress is laid upon that too often neglected aspect of native economics, " the relation of human beings to their soil." " More than half of the troubles in racial contact come from the white man's ignorance of land tenure."

In the second volume we are given " an ethnographic theory of language," forming the basis of an attempt " to indicate the character of human speech in general and the necessary methodological approach to it." Here the anthropologist, the philologist, the psychologist, and the philosopher, or any combination of these, will find abundant material for argument, not to say controversy, ammunition being provided by the collection of native texts, with explanatory comments, which constitutes the greater part of the volume. A couple of quotations must suffice to indicate the nature of Dr. Malinowski's thesis. " Between the savage use of words and the most abstract and theoretical one there is only a difference of degree. Ultimately all the meaning of all words is derived from bodily experience." " Words are part of action and they are equivalents to actions." This view " compels us to correlate the study of language with that of

other activities, to interpret the meaning of each utterance within its actual context . . . a new departure in the handling of linguistic evidence."

These volumes are not for the casual skimmer of pages. But the reader who is willing to devote to them some measure of the concentrated industry, alertness, and enthusiasm that went into their making, will acquire an intensive knowledge of gardening as carried on in the Trobriand Islands, and considerable insight into the theory and practice of the "functional method" in anthropology.

BEATRICE BLACKWOOD.

Reports of the Cambridge Anthropological Expedition to the Torres Straits: Vol I. By A. C. HADDON. (Cambridge University Press. 40*s*.)

Dr. A. C. Haddon first visited Torres Straits in 1888. He was then engaged in research in marine zoology: but the stories of their past told by the old men attracted his attention to the study of native folklore, culture, and origins. As a biologist he realised the importance of the geographical position of the Torres Straits. Lying between New Guinea—itself a stage on a line of communication stretching back to Indonesia—and Australia, the islands of Torres Straits are a key position in the study of the problems of ethnological distribution.

On his return home in 1889, Dr. Haddon devoted himself to the study of anthropology, and nine years later, in 1898, he organised and led into the field the famous Cambridge Anthropological Expedition, of which he has now completed the Report. In this volume (the last of the six to be published) Dr. Haddon sums up the results of these special enquiries; he summarises the information which is to be gleaned from other sources; to this he adds data which have since been collected, either by himself or by other observers; and finally, he analyses this mass of material and demonstrates the bearing of the evidence of the physical character and culture of the islanders in relation to the problem of the distribution of man between Indonesia and Australia and Tasmania.

The Cambridge Expedition to the Torres Straits must be regarded as the most important expedition that has ever taken the field for anthropological investigation. It was the turning point in field work, both as regard scope and method. For the first time psychologists, trained in laboratory methods, applied themselves to the study of reactions in the field; but, fired by Haddon's enthusiasm, they were not content to abide within the four corners of their special studies; they turned with avidity to the investigation of native culture. The men whom Haddon then trained were to have a profound influence on the development of anthropological theory and method throughout the whole of the next generation. A mere recital of their names is enough—W. H. R. Rivers, who then elaborated a method of genealogical study which has remained a fundamental principle in sociological investigation in the field ever since, and whose later study of Melanesian society is a monumental piece of cultural analysis; Sidney Ray, destined to be accepted as the greatest of authorities on the languages of New Guinea, and as only less learned in the languages of the Pacific generally; C. O. Seligman, who returned to New Guinea in 1904 to carry out a study of the Melanesian element in the peoples of New Guinea, which was a brilliant prelude to investigations of no less value and importance in other parts of the world; W. McDougall, joint author with Charles Hose of a profound study of the pagan peoples of Borneo, whose eminence as a psychologist owes not a little to his experience among native peoples in the field; and C. S. Myers, whose studies in anthropology gained a high repute, especially in the study of primitive music, before he returned to the fold of psychology. Anthony Wilkin, full of promise, died young.

In New Guinea the influence of the Cambridge Expedition has made a permanent impression; not only in the field of ethnography, where, indeed, the close personal touch maintained by Haddon, Ray and Seligman, with explorers, missionaries, and members of the administrative service has contributed materially to the advancement of knowledge of the native peoples; but also in the administration of native affairs—the most successful piece of administrative work in handling backward peoples that has yet been accomplished under British rule. For this credit must be accorded to the wisdom and foresight of the Australian Government, which took over the control of New Guinea in 1907, and in appointing Sir Hubert Murray administrative officer soon after, gave him full support in the development of the policy of adapting the results of anthropological investigation to the problems of administration through district officials trained in the anthropological outlook.

The Blending of Cultures: an Essay on the Aims of Native Education. By F. E. WILLIAMS. (Territory of Papua Anthropological Report, No. 10. 1*s*.)

The fundamental principles adopted in Papua for administrative work are the basis of argument in this admirable essay, which was awarded the Wellcome Medal for Anthropological Research in 1933. Dr. Williams's thesis is somewhat too closely argued to admit of condensation, and must be read in full to be appreciated. Broadly speaking, however, recognising that change is inevitable, it deprecates Europeanisation, while advocating the elimination of elements, such as head-hunting and sorcery, incompatible with administrative aims. At the same time its objective is to enrich native culture in essentials, such as horticulture and art, by the leaven of those European ideas or technical elements which may be assimilated without disintegrative effect. Those who are familiar with Rivers's views on depopulation in Melanesia will appreciate how much it has influenced Dr. Williams's line of approach.

An Aviary of the Plains. By HENRY G. LAMOND. (Angus & Robertson. 6*s*.)

Bird Wonders of Australia. By A. H. CHISHOLM. (Angus & Robertson. 6*s*.)

Insect Wonders of Australia. By KEITH C. MCKEOWN. (Angus & Robertson. 6*s*.)

It is no mean feat to take a town-dweller, dodging omnibuses in the chilly rain or scrambling for lunch in a crowded restaurant and to persuade him that he is riding a horse over the sun-baked plains of Australia, watching a battle to the death between a falcon and a flock-pigeon, or the dainty progress across the trail of a mother quail and her chicks. Yet this Mr. Lamond has done in *An Aviary of the Plains*. And what he has done to one he can do to many. The incessant cannibal strife of the bird world, the charm of family life, the mysterious organisation of the flock—all this is described with a vividness only to be attained by one who has communed with nature all his life.

Bird Wonders of Australia is a book of an entirely different nature. Mr. Chisholm knows all about his subjects; is as ready to describe their mating habits as the contents of their stomachs. The numerous illustrations are excellent. In fact, as a work of

reference no fault can be found with this book. But it stands in relation to that of Mr. Lamont as does the Imperial War Museum to a film of the Western Front.

In *Insect Wonders of Australia* Mr. McKeown puts a microscope to the eye of his reader. Mysteries of the insect world are solved by his descriptive pen and revealing photographs, and the why, if not the wherefore, of insect manœuvres become apparent. This book can be read with great profit in this hemisphere because the majority of the phenomena remarked upon are not exclusive to Australia and can be observed, at any rate in a modified form, in this country. On the other hand, those who are seeking for the strange and unusual will not be disappointed.

The British Isles. By J. F. Unstead. (University of London Press. 6*s.*)

Though described as a post-matriculation course, the first volume of Dr. Unstead's "Systematic Regional Geography" adds little to what is found in the usual school text-book. The treatment, however, is sufficiently distinctive to merit the careful consideration of all geography specialists. Absent is the customary treatment of our climate, our agriculture, etc., as a whole. Instead we are asked to regard the British Isles as a cellular structure of regions and sub-regions, the smallest units being termed "stows," which comprise but a few square miles of territory. Except for S.E. England, the stows are not treated in detail and only the larger divisions—"stow groups" and "tracts"—are described.

Geographers will stop to ask themselves how far this regional sub-division can be profitably carried. The value of Herbertson's conception of Natural Regions lies in its emphasis on the similarities which have made widely separated areas comparable. In the present work the tendency is to concentrate on definition, and boundary tracing becomes all-important. The author has boldly faced the difficulties inherent in the task, though not all geographers will agree with some of his results, e.g., the assumption that the southern limit of glaciation marks the boundary between East Anglia and the London Basin (p. 44) or the grouping of Worthing in Wessex (p. 85).

The climatic graphs are particularly useful and well-chosen. The illustrations are few, but effective. There is a useful bibliography and a glossary of regional terms.

Nanga Parbat Adventure. By Fritz Bechtold; translated by H. E. G. Tyndale. (Murray. 10*s.* 6*d.*)

The 1934 expedition to Nanga Parbat did not end in success, but, like other failures, it added a great chapter to the history of mountaineering and exploration. We are glad, therefore, to have this English version of the story, which is of the type to encourage renewed attempts and ultimate victory.

Here it is briefly told without consideration of scientific and technical aspects, an epic tale of tragedy, of success snatched away by the weather when it seemed within the climbers' grasp, and of disaster. Behind it lies a fine spirit of devotion to leader and fellow members of the expedition, of heroic work once again by native porters, and above all, the mountains themselves.

The story is told well, but even so, its chief glory lies, perhaps, in the illustrations. These are exceptionally good. Not only do they illustrate the route taken on the way up to the mountain extremely well but they are also pictures of very great beauty. It is to be hoped that Mr. Tyndale's zeal for translating the climbing achievements of other nations into our own tongue will lead to the publication of other books such as these.

North to the Orient. By Anne Morrow Lindbergh. (Chatto & Windus. 10*s.* 6*d.*)

The interest of this book lies chiefly, not in its record of a dangerous and romantic air-exploit, nor even in its descriptions of little-visited and widely different lands, but in the subjective attitude of the author. Mrs. Lindbergh tells us that she is not essentially a modern woman, but rather the helpmate of a modern man, and she has given us a penetrating account of the reactions of a woman-who-is-not-modern to the most modern of all transport methods. And just as the shrewdest observers of a nation are often foreigners, so one who is at heart alien to flying can supply the keenest analysis of the sensations experienced in a first-class flight. She uses her eyes and notes that shadows, from the air, assume an importance equal to that of the objects which cast them. In the flat and featureless landscape seen by the airman rivers are the only physical feature that shows up to greater advantage than from ground level.

In the account of the flight itself isolated pictures stand out in the memory: the initial difficulty with the radio, soon overcome; the little group of men "bushed" at Baker Lake in order to slaughter fur-bearing animals for Broadway shops; Point Barrow, accepting radio and aeroplanes without having known railways or motor cars; the friendly Russians of Kamchatka, who led the author to make one of the few sensible generalisations that have been made about Soviet Russia; and the exquisitely courteous helpfulness of the crew of the *Shinshima Maru*. Mrs. Lindbergh's shrewd sanity is rarely at fault; she has written a vivid description of a remarkable feat of skill and endurance without a trace of that distressing form of self-consciousness falsely described as "airmindedness."

Public School Explorers in Newfoundland. By Dennis Clarke (Putnam. 10*s.* 6*d.*)

This entertaining volume describes the adventures of the party sent out by the Public Schools Exploration Society under Surgeon-Commander G. Murray-Levick, R.N., to examine an unvisited area in the interior of Newfoundland. Apart from the leaders and one or two undergraduates, the party was made up entirely of Public School boys, and their experiences must have been a useful supplement to the normal curriculum. Mr. Clarke has provided a vivid account both of the country visited and the reaction of the visitors to it, the whole salted with a judicious spice of humour that never degenerates into facetiousness. He certainly converted one reviewer from the opinion that the expedition was little more than a flashy stunt. The work done was of genuine, if of minor, importance; and hardship was not sought after for its own sake.

The expedition was disappointed in its anthropological hope: the rediscovery of the Beothuck Indians; but it did map a large tract of unexplored country and made some useful notes (mainly negative, unfortunately) on the natural resources of the area. The timber, for example, was generally of too poor quality to be worth while exploiting, even for newsprint. Numerous observa-

tions are recorded, too, which will be of service to future parties of the kind: the fashionable vitamin complex led to the consumption of huge quantities of that unpalatable beverage, spruce tea; hot blueberries, where obtainable, were vastly to be preferred; and caribou moss was uneatable. Sealskin boots were all but useless. Hard walking proved successful as a cure for a mild case of mumps. The chief enemies were mosquitoes, damp, alders, and mosquitoes.

In the narrative the personalities of the members of the party come through distinctly; a good word, we are glad to say, is said for the cooks, and the sheer heroism of the cartographers is underlined. The mishaps make very amusing reading in an armchair, but they were probably less so at the time, and the "Gleed Business" had the makings of a first-class tragedy.

The wisest word of all is that there is no freedom in the wilds; when the first sensation of relief from the bonds of civilisation has worn off, there is nothing but a hard grind and a revolt against continual discomfort. Mr. Clarke in no way discourages enterprising youth from repeating the process, and he paints a realistic and not a rose-coloured picture for those who come after.

The Theory of Atomic Spectra. By E. V. Condon and G. H. Shortley. (Cambridge University. 42*s*.)

Although speculations on the nature of the rainbow must have been made at very early times, and Newton's celebrated experiment on the production of colours when white light passed through a prism was made over 200 years ago, the science of spectroscopy has practically had only fifty years of life. This short life has been packed with incident, and in the last few years what can be called a consistent scheme of interpretation of line-spectra has been arrived at.

From their appearance, spectra are classified as continuous, band, or line-spectra. The first are due in the main to incandescent solids, the second to molecules, and the last to individual atoms. The line-spectrum of an atom is characteristic of it, and this caused the early history of spectroscopy to be concerned mainly with the identification of elements, and led to interesting astronomical developments. Further, the spectrum emitted is not only characteristic of the atom, but is different according to the state of ionisation of the atom; i.e., if the atom has lost one or more electrons, depending upon the vigorousness of the excitation, it will give rise to different, but still characteristic, spectra. Slight modifications are caused by the application of magnetic or electric fields to the region in which the source is placed, or by increasing the pressure.

The relative positions, intensities, and states of polarisation of the lines, and the modifications which they undergo when disturbing forces are applied, can now be calculated approximately, using the quantum-mechanical theory of the nuclear atom. The theory exists in a somewhat closed and complete form, and the purpose of the present monograph is to give a unified, deductive treatment of atomic spectra in terms of this theory.

The authors do not, however, say "Spectroscopy is finished," as a well-known spectroscopist is reported to have said in 1925. They say, "Complete as the general picture seems at present there may well be lurking somewhere important residual effects, like the advance of the perihelion of Mercury in celestial mechanics, which will necessitate essential alterations in the theory."

The book is highly mathematical: it is not intended as a first approach to the subject. Group theory is not used, intentionally —"We manage to get along without it." It can be recommended to those possessed of reasonable mathematical skill, or to those requiring a reference-book (the tables are particularly useful). It is not for the general reader.

A. C. Menzies.

Through My Telescope. By W. T. Hay. (Murray. 3*s*. 6*d*.)

In nineteen short chapters, written with admirable lucidity and in a manner intelligible to the least initiated, Mr. Hay tells the simple story of the Sun, Moon, and Stars, and of the way in which any amateur may study them for himself, with or without a telescope.

The information given is accurate and, if the author does not go into detail with regard to some of the latest discoveries, it must be remembered that the book claims to be no more than an introduction to the subject. As such it is quite adequate, and will serve to stimulate further interest and the desire to read more deeply.

It is perhaps unnecessary to say that in these pages our old friend, Will Hay, the schoolmaster comedian, appears for once as a really serious teacher; and Sir Richard Gregory reminds us, in his Introduction, that the author is a keen and active amateur astronomer of no mean distinction. The evident enthusiasm with which it is written is not the least attractive feature of this little book; and, as such enthusiasm is proverbially catching, we can only express the hope that many will thereby be induced to take up a hobby that has brightened the leisure hours of man and woman in many walks of life.

The Spanish Main. By Philip A. Means. (Scribners. 15*s*.)

In this scholarly work the author has given a reasonable definition to the somewhat vague conception contained in the name, "The Spanish Main." He includes the Antilles, Greater and Lesser, and the coast and coastward lands of Central and South America from Yucatan to the mouths of the Orinoco. Much of vital importance to this area was caused or influenced by events farther afield, and Mr. Means is careful not to neglect these. By means of a thorough consultation of authorities, many of them hitherto neglected, he has been able to produce a thoroughly documented work. We are glad to notice that he devotes special attention to the work of two indefatigable women: Alice Gould, whose classic research-work on the companions of Columbus is too seldom cited; and Irene Wright, authoress of many valuable works on the Caribbean Islands.

Mr. Means has not gone astray in the specious fog of romance that hangs over the area he deals with; his *conquistadores* are human beings, not devils or supermen. The seeker after blood and thunder will derive little satisfaction from the prosaic understatements of this book, which, for the serious reader, lend it an air of authority all the more emphatic. Yet even rigid truth cannot keep romance away from such exploits as Aleixo Garcia's little-known journey into Inca land from the Paraguay basin; Orellana's voyage down the Amazon; or the monumental stroll of Messrs. Ingram, Brown, and Twide from Mexico to Cape Breton after the (richly-deserved) English defeat at San Juan de Ulua.

The prevalent idea that most of the Spanish expeditions consisted of ruffians animated solely by a lust for gold is dispelled.

Ruffians there were, certainly, among the Spaniards as among the other nations (Aguirre is a first-class specimen), but the majority of the leaders carried out conscientiously their instructions to bring the natives by kindness into the fold of the Church and the dominion of the King. The principles outlined by the worthy Brother Francisco de Vitoria—the true Apostle of the Indies—were followed more often than is supposed. By the way, Vitoria is not "a small village," but the capital of the Basque province of Alava.

The British travellers do not come out too badly. Drake may have been a thief, but he certainly was a gentleman, and he is given due credit for this. Yet their colonising method of treating the native as a "nigger" was hardly more effective than the Spanish one of "hispanicising" them; here the French score, with their genuine attempt to understand native psychology and to allow for native peculiarities. It is quite on the cards that a couple of centuries hence the palm may be awarded them as the most successful of the great colonising nations. At any rate Mr. Means is quite right in recommending a reading of Père Labat's *Nouveau Voyage aux Isles de l'Amérique*.

It is, perhaps, inevitable that further prominence should be given to the Darien scheme, perhaps of all colonial projects the most ill-timed, ill-placed, and ill-fated. The bibliography and index are both good.

We Europeans. By JULIAN S. HUXLEY and A. C. HADDON, with a chapter on Europe Overseas by A. M. CARR-SAUNDERS. (Jonathan Cape. 8*s*. 6*d*.)

In *We Europeans* a biologist and an anthropologist have joined forces in a destructive criticism of the racial theories that underlie the nationalism rampant in Europe to-day. Extracts from the book which appeared in DISCOVERY (Sept., 1935, p. 252) before its publication will serve as a sufficient indication of the line of argument by which the authors have knocked the props from under antagonisms that belong to the realms of politics and economics, but have no footing in science.

The topical interest of this book in its bearing upon the present situation in international politics should not be allowed to obscure the fact that it will have a lasting effect in future research relating to the combination, distribution, and transmission of those physical characters in man, variation in which has been regarded hitherto as marking difference in race. For the te "race," however, our authors now propose to substitute the term "ethnic group."

Racial classification is one of the most difficult problems of anthropology. As knowledge of the physical characters of peoples has grown, and as the composition and relations of the elements of the unitary groups have become more clearly understood, it has become increasingly apparent that "race" is an abstraction, and the "races of man" a methodological assumption, in which the "racial types" are formulæ, devised by the anthropologist as convenient descriptive labels for certain ideal assemblages of characters, grouped for purposes of study. To go beyond this, and infer relationship from the degree of approximation to the pure type, in other words to distort a descriptive arrangement into a phylogenetic "tree" is the merest myth-making. A method legitimate enough in palæontology, where differences are specific and the units of classification do not interbreed, has been misapplied to the varieties of a single species, *Homo sapiens*, which not only are capable of interbreeding, but, it is known as an historical fact, have interbred since the earliest days of their existence. This process of interbreeding has brought about an intense tangle of strains, which cannot now be sorted out into "races" in the sense in which that term is generally understood.

While an ideal scheme of racial classification may have its uses for a student at a certain level of thought, the application of biometric methods to the study of the composition of ethnic groups, in giving a truer view of the elements composing them, has revealed that the facts are infinitely more complex than has been apprehended hitherto. The authors of *We Europeans* point out that there is need for more detailed observation and closer analysis of the facts, while the method of genetics and the application of Mendelian principles to the study of inheritance of physical characters in the members of ethnic groups afford an instrument for unravelling these complexities to which the anthropologist has perhaps paid too little attention. Race under their criticism has become a term so vague as to be undefinable; but the strain, the combinations of characters, which go to make up the ethnic groups are, it has been shown, the products of Mendelian inheritance and subject to its laws. Obviously the data for the application of such methods at present are scanty; but with the application of improved methods of observation and analysis on the lines suggested their collection is merely a matter of time. The most important step has been taken when two outstanding exponents in their respective, but related, fields give definite form to tendencies already apparent in these studies and advocate the introduction of new methods to take the place of those which they have shown to be obsolete.

The Successful Teacher. By MARY BIRKINSHAW. London. (Hogarth Press. 3*s*. 6*d*.)

This is a very interesting study in occupational analysis, carried out under the supervision of and partly financed by the National Institute of Industrial Psychology. It is based on the replies of over 1,000 women teachers in secondary schools to two questionnaires, and on some 90 interviews with them by the writer and on reports from their colleagues. She concludes that "at least 22.1 . . . per cent. of those [583 teachers] who replied to the first [more detailed] questionnaire would not be wholly satisfied with teaching as a profession in any circumstances." Teachers who were wholly unsuited to their profession, when asked why they chose teaching as their career, gave as their motives, more frequently than other teachers, the desire for security, the influence of relatives and other people, and the attraction of a teaching grant. The greatest amount of dissatisfaction was found among teachers of domestic science, art and music: most of these dissatisfied teachers desired a wider outlet for their interests; e.g., they wished to have been professional artists. Teachers of general subjects and of physical training were those most often satisfied with their choice of career.

In this brief notice a fair summary of the many suggestive results of this preliminary investigation is impossible. Various chapters are devoted to the teacher and her hours of work in school, to the teacher in her environment and relations out of school, and to the study of those who are unsuited to the teaching profession and of those who are happy in it. The results are based wholly on the data yielded by direct inquiry. The writer finally stresses the need for a further, more intensive, study of the conditions under which teachers work and for improvement in the current methods of selecting teachers for training.

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